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No. 53

THE LONDON NATURALIST

the journal of the
LONDON NATURAL HISTORY SOCIETY

Published: September 1974
Price: £1.50 post free

THE LONDON NATURAL HISTORY SOCIETY

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THE LONDON NATURALIST

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for the year 1973

Edited by J. R. Laundon
with the assistance of
R. M. Burton and K. H. Hyatt

World List abbreviation: *Lond. Nat.*

Published September 1974

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Printed by F. H. Brown Ltd., Sandygate Mill,
Burnley, BB11 1RP.

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Report of the Society for 1973 *

The satisfactory increase in membership reported last year has not been sustained and with some disappointment we record a net increase of four only for the past twelve months. Losses through resignation and death have almost exactly balanced with new enrolments and the totals of paid-up members as at 31 October 1973 are as follows:

Ordinary members	1,007
Affiliated Societies	18
Senior members	23
Family members	80
Junior members	55
Honorary members	14
Life members	17
	1,214

Since these figures were compiled, however, we have gained 26 new members, so that perhaps our position is not so gloomy as might appear.

We record with regret the following deaths during the year: Sir Neville Bland, Miss G. Fookes, Miss T. Gompertz, Dr John Harrison, R. Hooker, S. T. Jermyn, Miss E. Kiddie, A. Packman, J. H. G. Peterken, A. Rands, F. Reynolds and G. Wall. Obituaries commemorating some of these members are to be published in the Society's journals.

The Agreement we had with Ealing Library for the housing of our books was brought to an end in the early part of the year and our Library has been transferred to the Lyon Playfair Library at Imperial College, where the College Library staff have been engaged in placing the books on shelves. Members will be notified as soon as the Society's library is once more available for their use. We are grateful to the Librarian and his staff at Ealing for their valued help over the past ten years. At Imperial College the Society has found a warm and friendly atmosphere and we greatly appreciate the efforts of Mr Adrian Whitworth, the College Librarian, his colleagues and staff, to make us feel welcome. We are grateful to them all for the considerable amount of hard work they have already done for us, and we look forward to a happy relationship in the future.

The first of our meetings at Imperial College were held in the Departments of Botany and of Zoology this autumn, and we hope that this venue will prove popular with our members.

The first issues of our long awaited *Newsletter* were produced this year, though not without some problems. A. M. Hutson was talked into taking on the job of Editor and Mrs M. Anderson housed the office machinery and organised the production and despatch of both the *Ornithological Bulletin* and the *LNHS Newsletter* with a team of helpers from her home in Holloway. Unfortunately, these arrangements came to an end when, for family reasons, Mrs Anderson could no longer house the machinery. However, Imperial College once more came to our aid and our equipment is now installed in their premises, where we also enjoy some facilities for operating it. We now urgently need volunteers who can spare time now and then to go and help run off the pages, collate them and produce the addressed envelopes. If insufficient help is forthcoming, the bulletins will be in jeopardy. Helpers are also needed to provide a duplicating service for the Society's officers and addressed labels for the Society's journals and programme. Our sincere thanks go to Mrs Anderson for her stalwart work on the Society's behalf in this department.

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* Presented at the Annual General Meeting, 12 December 1973.

Our thanks for past services also go at this time to Mrs Housego (née Britton) who, after a service of ten years, is relinquishing her role of Librarian.

The Sections report a successful programme for the year, though attendances at formal meetings continue to be disappointing. The smaller Sections suffer most in this respect and one of them, Entomology, has put forward proposals for a thorough-going reorganisation of the Society. These proposals are now with the other Sectional Committees for their views and the whole matter will be considered by your Council when the Sectional reports are submitted.

We are sorry to lose our Secretary, Mr Peter Holland, who has served the Society in this capacity for three years, and in many other ways over the past twelve. Your Council has been pleased to appoint him an Honorary Vice-President in recognition of the valuable work he has done.

In conclusion our thanks go as always to those members whose diligent work behind the scenes contributes so much to the success of the Society, and to those friends who entertain and instruct us in the lecture hall and in the field.

Obituary

THOMAS LEWIS BARTLETT

Tom Bartlett who died on 1 May 1973 was known to many members. Through his courses at the City Literary Institute and Morley College he introduced a great number of people to the interest and pleasures of bird watching. His enthusiasm fascinated young people, and in the field, even in what should have been old age, he could match energy with anyone. He was truly a "character" and many are the tales told of his exploits, including catching gulls for ringing on the London bridges. A rowan, one of his favourite trees, has been planted in his memory in the Perivale Wood Nature Reserve of the Selborne Society where he did so much of his work with schoolchildren.

L. M. P. Small

The Story of the Natural History Museum

by Keith H. Hyatt

(*Presidential address delivered on 12 December 1973*)

The Natural History Museum is more correctly called the British Museum (Natural History). To naturalists the world over it is the BM. Extensions have been built in recent years, including the recently enlarged Rothschild Museum at Tring, Hertfordshire, where the Bird Section is now located. But what so many take for granted only materialized after a long, and at many times, unhappy history. The story revolves round three men in particular—Sir Hans Sloane, physician and naturalist, Alfred Waterhouse, architect, and Sir Richard Owen, first Director at South Kensington.

The British Museum dates its actual foundation from the year 1753 when an Act of Parliament was passed "for the purchase of the Museum, or Collection of Sir Hans Sloane, and of the Harleian Collection of Manuscripts; and for providing one General Repository for the better reception and more convenient use of the said collections and of the Cottonian Library, and of the additions thereto". This was the inception of the British Museum which was first opened to the public on Monday 15 January 1759.

These three collections, Sloane, Harley and Cotton, enumerated in the Act of Incorporation, were brought together in 1754 in Montagu House, Bloomsbury, which had been built for Ralph, Duke of Montagu, and purchased as a repository for the whole. One of these collections, the Cotton Library, can be said to be directly connected with the origin of the British Museum. This noted collection of manuscripts of biblical, historical and literary remains of the early Middle Ages, formed at the end of the 16th and beginning of the 17th centuries by Sir Robert Cotton, statesman and scholar, was housed in Ashburnham House, Westminster, when the building was destroyed by fire in 1731. About a quarter of the manuscripts were destroyed.

This incident induced the Government to consider a scheme of a general repository for that and similar collections, with the result that the 1753 Act was passed. The Harleian Collection of manuscripts was purchased in the same year but the books had already been sold. The collections were built up by Robert Harley, Earl of Oxford, and his son Edward, who devoted much of their large fortune to the purchase of books and manuscripts all over Europe. Sloane himself helped them to add to their collection.

Hans Sloane was born on 16 April 1660 at Killyleagh in County Down. His father Alexander Sloane was descended from a Scots family that came to County Down in the days of James I. And now the two hundred years that have passed since Hans Sloane's death have dimmed the outline of his figure to such an extent that for many people today he is nothing but a street and a square, when he is not confused with Sir John Soane, or the inventor of a liniment. Yet there is the British Museum at Bloomsbury and the Natural History Museum at South Kensington as monuments to his life, his work and his ideas. If it is difficult to rescue Sloane from oblivion it is even harder to bring him back to life, for he had no Boswell; and no anecdotes, gossip or table talk of his have been preserved, and he was overshadowed by such figures as Isaac Newton, John Locke and Christopher Wren, giants who have left little room for him in the public memory of the period during which he lived.

As a boy Sloane's health was poor. He was the youngest of seven brothers. We gather from what he wrote that he formed an interest in natural history at an early age, and took advantage of County Down and what it had to offer: Strangford Lough and its wildfowl, the Copeland Islands, and the peat-bogs. After recovering from a three-year illness he came to London at the age of nineteen to continue his studies and devote himself to medicine. It was the London of Christopher Wren, Samuel Pepys and John Evelyn, to name but three who were later counted among his good friends. After four years in London Sloane decided it was time to undertake the Grand Tour. So in 1683 he set out in company with two fellow students for Paris. He then moved south to Orange, near Avignon, where he took his doctor's degree. Then on to Montpellier, and in the following year, 1684, he returned via Bordeaux and Paris to London.

Sloane progressed rapidly, and his qualities as a searcher after knowledge were beginning to earn recognition. At the age of 24 he was elected a Fellow of the Royal Society, and in 1687, three years later, he was admitted as a Fellow of the Royal College of Physicians.

At about this time the Duke of Albemarle was appointed Governor of Jamaica and was desirous of finding a doctor to accompany him and his family on the voyage. Sloane was deeply interested in the idea and he sought the advice of friends, one of which was John Ray, the gentle and illustrious naturalist who laid the foundation of the science of classification of plants and animals. Ray replied to him with cautious but genuine approval. He pointed out the hazards of so long a voyage, and also the vast amount of knowledge that was to be gained by such an undertaking. Ray emphasized the value of seeing whether there were any plants common to America and Europe; perhaps the earliest approach to one of the most important problems of the geographical distribution of species. Sloane's interest in zoology also provided an incentive for him to undertake the journey.

The story of Sloane's journey to Jamaica is well documented in his own journals. They have the freshness that would be expected in a narrative of one of the earlier Englishmen to undertake a naturalist's voyage to distant parts by sea, thereby setting a tradition which, including as it does the voyages of Sir Joseph Banks, Robert Brown, Darwin, Huxley, Hooker, Moseley and many others, has been one of the prides of British science.

Sloane boarded ship on 12 September 1687 and was soon recording his observations on gulls and terns. He recorded small passerine birds on the ship's rigging when well out of sight of land, and he observed porpoises and jelly-fish, a small "sparrow-hawk" of sorts, and a large grasshopper which landed on board. On reaching Jamaica Sloane devoted himself to an intense study of the island: its flora, fauna, geography and inhabitants. He also kept meteorological records. During his stay on Jamaica the Duke of Albemarle died and the Duchess wished to return to England, so his exploration of the island came to an end. He gathered together his collections and on 16 March 1689 set sail. He had difficulty in keeping some of his Jamaican livestock on board ship. They comprised a seven foot yellow snake, a giant lizard and a crocodile, but before they reached England the creatures had either escaped and been shot, or as in the case of the lizard, had jumped overboard.

Back home Sloane's duties kept him fully occupied in his profession as a physician. In 1693 he became Secretary of the Royal Society. He had become famous. His house was full of collections and he set aside a day a week for the entertainment of scientific friends at a dinner and a conversazione.

In 1712 Sloane felt the need for a house in the country and bought the Manor House at Chelsea from Lord Cheyne, but it wasn't till 1742 that he took up residence there. In 1714 he attended the death of Queen Anne, and two years later had a baronetcy conferred on him by George I, whilst in 1719, in his sixtieth year, he was elected President of the Royal College of Physicians.

Sir Isaac Newton, President of the Royal Society, died in 1727 and Sloane was elected as his successor—a position he held for fourteen years. In 1736, when in his seventy-sixth year, Sloane was visited by the twenty-eight year old Swedish naturalist, Carl Linnaeus. After leaving England Linnaeus thanked Sloane warmly for allowing him to see his "incomparable Museum". When Sir Hans Sloane died, on 11 January 1753, he had been a Fellow of the Royal Society for sixty-eight years, the longest time known.

The word Museum originally meant a temple devoted to the Muses, and was first applied to the Academy of Alexandria in the third century B.C. It first began to be used for collections of objects of interest only in the sixteenth century when museums were first established in Italy. In England the first museum of natural history was founded by John Tradescant at Lambeth in 1629, which after its transfer to Oxford in 1683 formed the nucleus of the Ashmolean Museum.

Sloane's first collections were mainly botanical and consisted of dried plants which he had brought back from France and the West Indies. An account of his collections is given by John Evelyn in his Diary for 16 April 1691. It commences: "I went to see Dr. Sloane's curiosities, being a universal collection of the natural productions of Jamaica, consisting of plants, fruits, corals, minerals, stones, earth, shells, animals, and insects, collected with great judgment . . . . . ". The Sloane herbarium in the Natural History Museum fills 337 large folio volumes. It contained his own plants together with those of other botanists that he had purchased. During 1941, after bomb damage to the Museum, some of Sloane's collections were doused with water being played on a fire, and one of the seeds which must have been two and a half centuries old, germinated. It was the oldest calendar-dated case of germination so far known. Sloane's zoological collections have largely perished or been discarded, but heavy objects, like buffalo horns and rhinoceros heads, have survived. Also some of his shells, insects and fossils are extant. Sloane's museum acquired the reputation of being the most desirable repository for documents and objects of scientific importance since it afforded the best guarantee of their being preserved and made available for students. Overall his museum was more extensive than any others of the time, although in certain particular fields others excelled his. Like all men of science Sloane came in for much ridicule, and Joseph Addison considered that to study insects was to misuse the intellect. Alexander Pope and Edward Young were among those who mocked Sloane in their poems.

In his will Sir Hans Sloane instructed that his Trustees were in the first instance to offer to the King, for the nation, his museum provided £20,000 were paid to his two daughters. Failing this it was to be offered at the same price to The Royal Society, the University of Oxford, the College of Physicians at Edinburgh, and the Royal Academies of Science in Paris, St Petersburg, Berlin, and Madrid, in that order. The Trustees prepared lengthy petitions to Parliament and had to prove that the collections were worth over £20,000. This was not difficult, and on 19 March 1753 a resolution was moved that Sir Hans Sloane's legacy be accepted for the nation. Less than three months later, on 7 June 1753, His Majesty King George II pronounced the Royal Assent and the British Museum was founded.

For a long period, in fact until 1801 when the Egyptian antiquities arrived from Alexandria, Montagu House was made to accommodate the library and museum together with the collections which had subsequently accrued to them, but now more space was required. In 1816 accommodation for the Elgin Marbles had to be obtained by temporary additions to the old building, and in 1823 space was demanded for the extensive library of George III which had become public property. It was now apparent to what dimensions a combined national library, museum of art, archaeology and natural history might be expected to attain, and the Government ordered drawings to be prepared for the erection of an entirely new museum. By 1845 the four sides of the present British Museum building had been erected to Sir Robert Smirke's design and Montagu House had to be removed.

But even this was not sufficient despite the erection of the magnificent reading room in 1857 which for a long time delayed the need to find accommodation for the ever-growing library. The collection grew apace, and during 1858 the most eminent British naturalists signed a memorial to the Chancellor of the Exchequer, Disraeli, proclaiming that "as the chief end and aim of natural history is to demonstrate the harmony which pervades the whole, and the unity of principle, which bespeaks the unity of the Creative Cause, it is essential that the different classes of natural objects should be preserved in juxtaposition under the roof of one great building". There was thus much concern that the collections may have to be dispersed as the Museum was becoming congested, but as it was realized that the Conservative Government was unlikely to authorize the enlargement or reconstruction of the existing building, then the entire removal of the natural history collections was an attractive alternative. In the event it was nearly a quarter of a century before the "one great building" was completed. There had been many delays in the planning stages but the zest of Victorian curiosity and boldness of Victorian exploration did much to sustain the enterprise. Even in those days there were official economies to contend with.

The chief instigator of the Natural History Museum was Sir Richard Owen who lived from 1804–1892. In 1856 he left his post of professor of comparative anatomy at the Hunterian Museum in Lincoln's Inn Fields to become superintendent of the natural history departments. This position he retained and he became the first Director of the new museum at South Kensington. Its completion owed much to his vigour, but many of the attendant difficulties were due to his unpopularity.

In 1859 Owen made a report to the Trustees of the British Museum on the removal of the natural history collections, and this he accompanied by rough plans for a building to house them. He did not attempt to suggest the architectural form but he emphasized the need for space, and because he envisaged a single-storey building it would have occupied 10 or 11 acres—three times more than the present Museum. Owen conceived that the museum should be large enough to exhibit the development of life on earth and also to exhibit a high proportion of the collections so that the "intelligent wageman, tradesman or professional man" is enabled to identify his own specimen with one exhibited and showing its correct name and locality. Owen planned a lecture theatre where heads of departments could explain their collections "in short, elementary, and free Courses of Lectures", and also a central apartment containing two special displays, one of "specimens selected to show the type-characters of the principal groups of Organized Beings", the other to show illustrations of each "class, order and genus" as were afforded by the native species of the British Isles. A potential site for the Natural History Museum was the 1851 Exhibition Commissioners' estate at South Kensington, where the Commissioners' President, the Prince Consort, was eager to bring together collections illustrating science and the arts.

Late in 1859 the Trustees considered the cost of an addition to the site at Bloomsbury for the natural history collections, or their removal to South Kensington. The estimated costs of land and building for various schemes ranged from £600,000 to £1,280,000 but in all cases the South Kensington alternative was much cheaper.

In January 1860 the Trustees agreed to move the collections and negotiations were proceeded with the 1851 Commissioners for the purchase of a five-acre site whose location you are all familiar with. The boundary of the Royal Horticultural Society's intended garden would have made it long and narrow, but as it was intended now to erect two storeys it would have given a greater floor area. However, in August of that year (1860) a Select Committee of the House of Commons reported adversely on the scheme. It was noted that with the exception of Sir Richard Owen, all the scientific naturalists and Keepers of the natural history departments at Bloomsbury were of the opinion that an exhibition on so large a scale would be fatiguing to the public and an impediment to the scientific visitor. There were other divergences of opinion and Owen's ambitions were severely criticized by the House of Commons in 1861, although he enjoyed the support of the Chancellor of the Exchequer, now Gladstone, himself a trustee. A close friendship here developed based on a common concern with the relations of science and religion, and the plans consequently gained more frequent Treasury support than those of other enterprises at South Kensington. Outside of the Government professional jealousies were rife and T. H. Huxley distrusted Gladstone and Owen equally.

In May 1862 the Prime Minister, Lord Palmerston, introduced a Bill to authorise the removal of the collections, and the recently widowed Queen was anxious that this step towards the realization of the Prince's plans for South Kensington should be taken. Again politics intervened and Parliament was hostile to the removal of the collections from central London to the new suburb, as well as to Owen's ambitions. Gladstone was labelled as a spendthrift and the Bill was defeated as enough members of the Government voted with the Opposition. The Queen was extremely annoyed, but Owen was encouraged by Gladstone to persevere and a more modest scheme, covering four acres, was prepared at an estimate of £350,000. However, later in the summer of 1862, Gladstone, in his triple capacity as

Trustee of the British Museum, 1851 Commissioner, and Chancellor of the Exchequer, had another scheme—to relieve the Commissioners of the embarrassing Exhibition Building and at the same time give the natural history and other museum collections an economical home by the purchase of the 16-acre Exhibition site and buildings. This was offered by the Commissioners for £120,000, that is £7,200 per acre, which in those days was considered cheap. The Queen appealed to Lord Derby and Disraeli and after some delicate canvassing the House of Commons approved in June 1863 the purchase of this site. But there were more difficulties—the Exhibition contractors still had an interest in the buildings that had to be bought out for £80,000, and the adaptation of the premises required at least another quarter of a million pounds. In Parliament this was the heyday of the independent member, and Captain Fowke's huge ungainly structure had become the focus of resentment at the money being spent at South Kensington. Back-benchers defied Gladstone and Disraeli and vetoed the acquisition of the Building. The contractors proceeded to pull it down, and thus disappeared the prospective home of the natural history collections.

Out of all this though, the Government now had at its disposal the spacious site where the Museum now stands, and in January 1864 the First Commissioner of Works, W. F. Cowper, announced an open competition with prizes of £400, £250 and £100 for the design of a museum complex here. It is disappointing to record that considering the magnitude of the project none of the most eminent architects of the day competed. There were 33 entries of which two were Gothic. When the identities of the competitors were revealed the judges found they had given first prize to none other than the Exhibition Buildings' architect 'the redoubtable Captain Fowke'. Fowke's design covered over four and a half acres and was so arranged that it could be executed in part without loss of symmetry. It was on the whole well received. *The Builder*, identifying the style as Bramantesque, liked it with some reservations, and *Building News* thought it unchaste but effective. Other critics discussed the feeling and effectiveness of the design. Professor Robert Kerr, who won the second prize in the competition, protested that Fowke had not observed some of the conditions of the competition. To strengthen his protest Kerr had also acquainted himself better with the prevailing opinion within the British Museum, and in March 1865 the Trustees told the Treasury that they preferred Kerr's design. They objected to the great height and length of Fowke's compartments amongst other things, although the heads of the departments were not uniformly dissatisfied with Fowke's planning. J. E. Gray, the Keeper of Zoology, was the chief critic. Sir Richard Owen went to Edinburgh to look at Fowke's newly built natural history museum there, and Fowke was instructed to adjust his plan in consultation with the Trustees; but in December he died. An appeal was made immediately to the Queen to protect Fowke's design from mutilation as Her Majesty was grieved by the death of someone so closely associated with the Prince Consort's aims in South Kensington. The First Commissioner of Works, W. F. Cowper, mentioned earlier, championed Fowke's design to the Treasury and in February 1866 appointed an architect to execute it.

The architect chosen was Alfred Waterhouse, then 36 years old and about to enjoy the fulness of professional fame. He had designed the Assize Courts in Manchester, which some considered would have made him aware of the unexpected difficulties the arrangement of a museum might present. Waterhouse followed Owen to Edinburgh, and he also examined Fowke's buildings and plans at South Kensington. Then in 1866 the Liberals went out to the Conservatives and Cowper was succeeded as First Commissioner of Works by Lord John Manners. The vote of funds for the building was postponed for nearly two years. In 1868 Waterhouse was commissioned to prepare plans and he was empowered to revise Fowke's elevations if necessary. In March of that year the plans, with sections and perspective views, were submitted to the Office of Works. At Strangeways Prison, also in Manchester, and then just completing, Waterhouse had used Romanesque motifs, and at South Kensington he now proposed the round-arched style common in southern Germany in the 12th century. He thought it would "afford both the grandeur and simplicity which should characterize a building of this description". At a later date Waterhouse gave his wish to use a facing of terracotta blocks rather than Fowke's renaissance style. This may well have been due to Owen's advocacy of "objects of natural history" as ornamentation.

In April 1868 the Trustees approved the plans with some modifications, but any prospect of immediate progress was illusory. Waterhouse estimated it would cost £495,000. Lord John Manners said the size would have to be reduced and suggested modifications such as the omission of various towers. But, in December the Conservatives went out and back came the Liberals and Gladstone. Plain sailing again, you might say, but no. Henry Layard at the Office of Works preferred a superb site on the Embankment between the Hungerford and Waterloo Bridges, and a further eighteen months were taken up with the study of this attractive scheme before it was found to be impracticable.

It is now May 1870 and we are back again at South Kensington. By August Waterhouse produced a design to fit the Government's limit of £330,000. The new site was to be some five feet below the level of Cromwell Road and farther south, being detached from the Horticultural Gardens buildings. The Museum was now taking shape, still on paper though, and it was some years before Owen realized that the lecture hall had vanished from the scheme. Perhaps Owen was more eager that his colleagues should lecture than they were themselves. Another significant omission was the allocation of a General Library. The transference of the Banksian Library from

Bloomsbury was frustrated by the Trustees. It was not until after the last war, in 1955 in fact, that a General Library was specifically provided for.

Early in 1871 Alfred Waterhouse produced full plans and his fee was five per cent of the £330,000, but it was still not all plain sailing. The Museum authorities could not agree with Waterhouse on the arrangement of public galleries and staff and student needs, so in early 1872 he submitted yet another set of plans, the most noticeable difference being the siting of the building still nearer to Cromwell Road. In July specifications were being prepared for invitations for tender and in September tenders were submitted. The lowest was for £395,000. Waterhouse was once more set to work on reductions although a 12 per cent wage increase had raised the 1870 estimate to £352,000.

George Baker and Son, the Lambeth builders, won the contract in February 1873 from 17 competing firms and Gladstone celebrated the event with a CB for Owen. By September the foundations were up to ground level. More economies were made as building progressed and some of these are perceptible in the Museum as built. Most were of no consequence to ourselves but when the Conservatives came back in office in 1876 financial restrictions were temporarily less severe, although the terracotta makers were being difficult and the contractors had to send a representative to live at the makers' works in Staffordshire.

In the summer of 1879, when the building was nearly finished, the contractors failed. One cause of this had been blamed on Waterhouse's attempt to give a two-colour effect to the terracotta facade when the material was in difficult supply, but other causes, like a masons' strike, the death of two of the contractors, and the lack of Baker and Son's "generalship" were put forward. The official explanation was rising costs. An outstanding feature of the terracotta detailing was that it illustrated living and extinct examples of the Museum's contents. Owen suggested to Waterhouse appropriate examples and the latter had plaster models cast before manufacture in terracotta. The east wing was decorated by extinct species and the west wing by living species, corresponding to the distribution of the geological and zoological collections.

The building was now completed at a cost of apparently £413,000 compared to the original final estimate of £330,000. To this was added Waterhouse's commission of five per cent—nearly £20,000. There was then the cost of furniture and cases, and in December 1877 the Treasury accepted an estimate of no less than £177,045 for these and Waterhouse was directed to design them. In the latter part of 1879, however, financial difficulties overtook Disraeli's Government. The country's imperial status had helped the growth of the collections, but economies were now required to sustain overseas involvements, or as the *Building News* for October 1879 aptly put it, "for the hunting and slaying of Zulus and Afghans"—a phrase that was echoed by Owen later. These economies resulted in a further lack of funds for display cases so the Office of Works' surveyor designed these and claimed the credit. With this exception Waterhouse's hand was seen throughout—the painted plaster ceilings, stained glass windows, mosaic pavements, ornamental ironwork, roof slating, and of course the building itself.

The Building was handed over to the British Museum by the Office of Works in June 1880 and three of its four departments were opened to the public in April 1881. The last gallery—zoological—was opened in 1886. Owen at last had his great museum oriented mainly towards public display, and in 1883 Gladstone gave him the KCB. The building was received favourably and the *Companion* to the *British Almanac* went so far as to call it "forward-looking" in contrast to the "backward-looking" Law Courts.

Ancillary buildings were later put up by Waterhouse—the separate building for collections preserved in spirit (now demolished) and costing £7,200 and built by George Shaw in 1883, and the lodge near Queen's Gate built by Mowlem's for £2,300.

The Natural History Museum flourished, scientific staff increased, and accommodation became more and more cramped. Extensions to the Museum have always been a live topic for discussion. Workers all over the world have expressed concern that limitations are imposed on expanding a great institution such as ours. But now we can see the result of several desirable extensions of public galleries, staff accommodation and administrative offices: the new Spirit Building built of reinforced concrete to the north-west of the Museum and the Whale Hall of brick in the north, both put up between the last wars, the brick Entomology Block to the west, started before the last war and completed in 1952, the tall North Block housing the Mammal Section, a modern Lecture Hall, and the first planned General Library, built in 1955, the North-East Block, just completed, and into which have expanded the General Library, the Zoological Library and several sections and offices, and now the eastern extension facing Cromwell Road to house the Palaeontology Department.

The Bird Section has recently moved from the Entomology Block at South Kensington to our country branch, the extended Rothschild Museum at Tring, and the insects, true to form, have quickly taken over all the available space in the building that was put up specially for them.

Inside the Museum the Botanical Gallery, which was damaged during the last war, was reconstructed in 1962, and many of the galleries are being 'modernized'. Most will agree that the new displays, although masking much of Alfred Waterhouse's work, are abundantly more effective. Only the side-lit galleries along the front of the west wing preserve the relationship between the pier-cornices and display-cases intended by Waterhouse.

The Biological Effects of Pollution on a Stretch of the River Wandle 1970-1971

by Brenda J. McCrow

"Just where the welling of stainless water, trembling and pure, like a body of light, enters the pool of Carshalton, cutting itself a radiant channel, all waving, which it traverses with its deep threads of clearness; .... just in the very rush and murmur of the first spreading currents, the human wretches of the place cast their street and house foulness; heaps of dust and slime, and broken shreds of old metal, and rags of putrid clothes; they having neither energy to cart it away, nor decency enough to dig it into the ground, thus shed it into the stream to diffuse what venom of it will float and melt, far away, in all places where God meant those waters to bring joy and health".—Ruskin's comment on the polluted nature of the River Wandle in 1866.

Introduction

The River Wandle rises among the springs that emerge where the chalk dips beneath the Lower Tertiaries at the level of about 60 metres (200 feet) near Croydon. It flows northwards, entering the Thames near Wandsworth Bridge (Fig. 1). Thus from source to outlet it flows through a built-up and industrialised area and is inevitably subject to a considerable amount of pollution.

The river is only some 18 km (11 miles) long, but in that distance it falls about 40 m (150 ft), although this is not a uniform drop. This made it an ideal source of power and it has a long history of industrialisation. As early as 1086, in the Domesday Book, there is mention of as many as 13 water-mills grinding corn. During the eighteenth century, in the river's industrial heyday, there were no less than 68 water-wheels, an average of one every three hundred metres. At that time the Wandle was one of the busiest rivers in the world. An account of its industries can be found in Hobson (1924). It was also at this time that concern was first generally expressed for its polluted state (Braithwaite 1861). The old water-wheels gradually fell out of use with the introduction of steam engines and electric power, but the river's banks are still the site of many industries today.

The Wandle is formed from two main streams, the principal one now having its head at Waddon, whilst the other flows from Carshalton, where it has its head in the Ponds (Fig. 1 inset). The two streams unite to form one river at Hackbridge. Thence onwards the river receives only one natural tributary, the River Graveney, which flows into it from Tooting. The considerable effluent from Beddington Sewage Farm forms a very significant artificial tributary.

At the time of the investigation, April 1970 to April 1971, three sewage effluents, from the Beddington, Wimbledon and Wandle

Valley sewage works, were being discharged into the Wandle along with "a few trade effluent discharges, which consist very largely of cooling waters and flows from surface water sewers, which occasionally contain unauthorised discharges from factories and other premises" (GLC 1967).

By an edict of 1606 the hunting and fishing on the Wandle, from Croydon to Wandsworth, were made into a Royal Preserve. The Wandle was famous as a trout-stream, being referred to by Camden in 1586 as "the cleare rivulet Wandle so full of the best trouts". At the time of the investigation only sticklebacks were found and then only in the upper reaches of the river.

To keep a check on pollution, the river systems are sampled by Greater London Council inspectors at selected points at regular intervals, some monthly and some quarterly, and dissolved oxygen estimations are carried out at the time of sampling. Factory and sewage effluents are sampled monthly and the large number of surface water outfalls are systematically inspected and sampled "according to conditions found by experience". In addition to the full river surveys samples are taken fortnightly from the river at a point near its junction with the Thames in order to calculate the effective oxygen load. The samples are taken on different days and at different times as the pollution varies in quality throughout the day. According to the annual abstract of GLC statistics, a large proportion of the samples taken are unsatisfactory in relation to recommendations of the Royal Commission of Sewage Disposal, and attempts are being made to try to improve the nature of the river.

The River Wandle today is certainly very different from the river that Isaac Walton praised for the excellence of its trout; that Pope called "blue transparent Vandalis"; and that John Evelyn, in 1675, called "the most crystal stream we have in our country".

Much of the river is inaccessible to the general public and in parts where the river is at least visible, high fences and artificial banks make sampling impossible by simple means. However, thanks to the work of the "River Wandle Open Spaces Society" (prior to 1939), there are several open spaces along the banks, particularly south of Wimbledon, where sampling is possible.

The Stretch of the River Studied

An attempt was made to investigate the biological effects of pollution on a stretch of the river from one of its sources in Carshalton Ponds to a point downstream where the Wandle leaves Morden Hall Park (National Trust). In this six and a half km (four mile) stretch the condition of the river deteriorates fairly rapidly. Samples were taken at four points along it (Fig. 1).

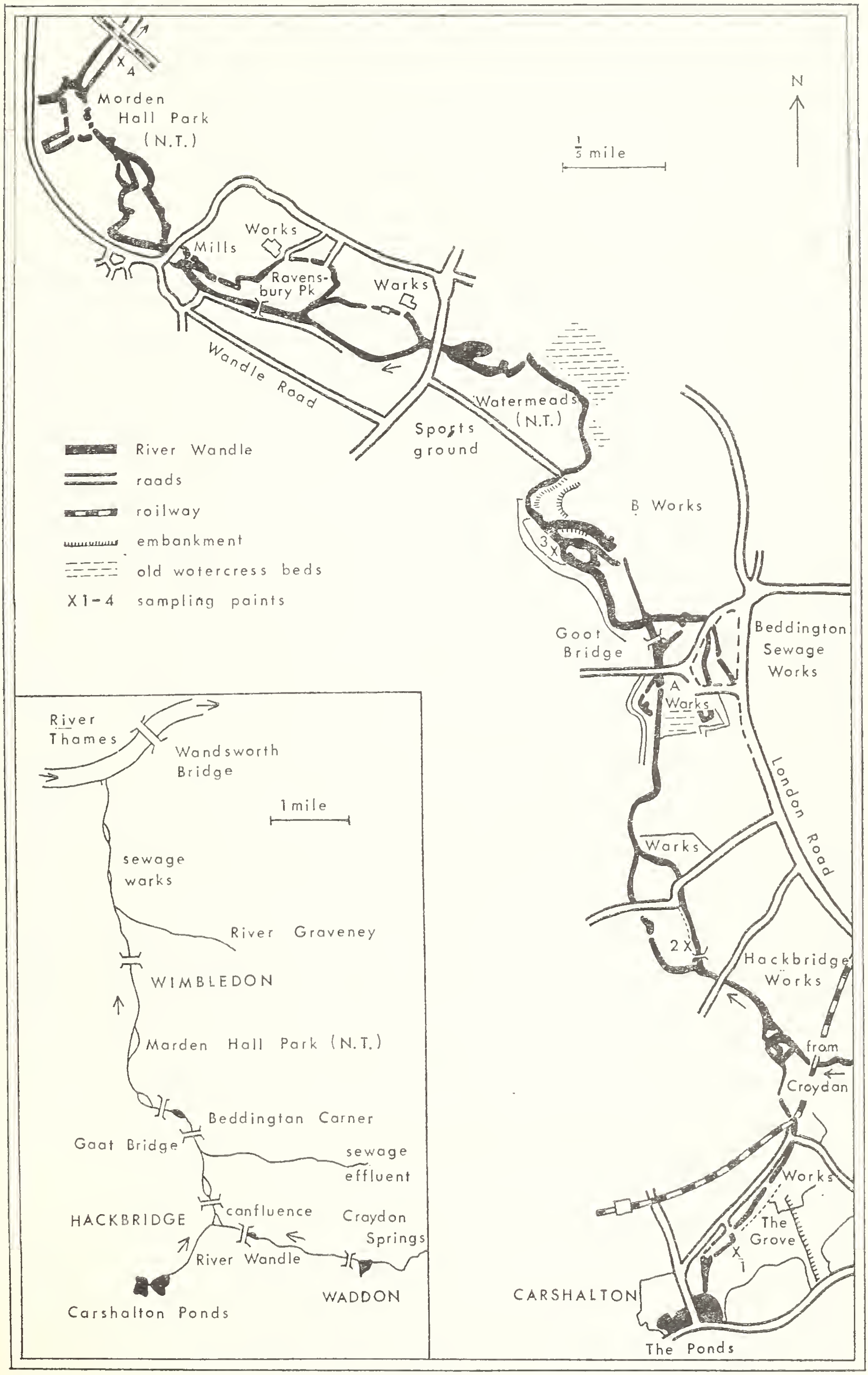


FIG. 1. Map showing the locations of the sampling points. The inset map shows the River Wandle from its sources to the Thames. Crown Copyright reserved.

Carshalton Ponds, formed from chalk springs, rarely freeze. Once a single pond, now divided by a roadway, the slightly higher west pond overflows into the east pond. There are disused water-cress beds and a nineteenth century snuff-mill within the grounds of the park known as "The Grove", in which the ponds are situated.

Sampling Point 1 (*The Grove*)

Grid ref. TQ 280648

The first sampling point used in this investigation is less than 40 m from a three metre-high cascade in the grounds of the Grove, and only six metres from a 'fall', approximately half-a-metre high. Artificial banking ends at the latter and from there until the Wandle leaves the park, about 100 m further on, the banks are grass-covered and in places overhung by trees and shrubs. At the sampling point itself, the bank is some third to half-a-metre higher than the water-level. At this point the Wandle is approximately six metres wide and twenty-six centimetres deep at a distance of one metre from the bank. Throughout the investigation the depth of the river at all four sampling points never fluctuated more than a few centimetres. The water here is clear and the bed of the river can be seen quite distinctly, with a flourishing growth of aquatic plants in numerous places including *Callitriche platycarpa*, *Rorippa nasturtium - aquaticum* and *Lemna minor* in slow stretches near the bank. Various algae including *Spirogyra* are also found here.

Several metres from sampling point 1 the river bends and then leaves The Grove and runs parallel to Mill Lane, whose name retains the memory of the old water-mills now replaced by a chemical works and synthetic resin works not reliant on water-power. Continuous trickles of steaming water can be seen discharging into this stretch of the river. A little further on, this branch of the Wandle unites with the waters which have their source in Croydon. Soon after the confluence of the two, the Wandle flows under a bridge at Hackbridge and widens into two channels. The more easterly of these has two falls (of between a half and one metre in height) which are approximately 50 m apart. Some 15 m from the second of these, where the river flows past waste ground behind houses, is the second point at which samples were taken.

Sampling Point 2 (*Hackbridge*)

Grid ref. TQ 281659

This branch of the river is approximately eight metres wide and twenty-five centimetres deep, one metre from the bank. The latter is about one metre higher than the surface of the water, increasing to one-and-a-half metres in places where it has been built-up artificially. The artificial banks are set with pipes through which surface water drains into the river.

Here the bottom of the river, again bordered by various trees and shrubs, can be seen reasonably clearly. One or two stems of *Callitriche platycarpa* grow in places but "sewage-fungus" is also often found covering the river-bed, although the degree to which it flourishes varies considerably during the year. The white and brown masses of "sewage fungus" are an association of fungi, bacteria and ciliate protozoa. A considerable amount of rubbish is dumped into the river, including pram wheels, tins and "oil drums", and small rainbow patches of petrol float by.

The river reunites and flows past allotment gardens into the 'Wandle Trading Estate' (Works A on Fig. 1). Here there are electrical engineering works, wood case works, chemical works, enamelling, rubber and leather works and a dyers and cleaners. The large effluent from Beddington Sewage Farm joins the river at Beddington Corner. A little downstream from Goat Bridge where waters, from a channel flowing through another trading estate (Works B, which includes smelting works, scientific instrument works, leather works, a surgical appliances factory and a waterproofing solutions factory), unite with the waters which flow under the bridge, slight foaming occurs as this stream passes over a fall about a third of a metre high. More than 200 m further on, where the relatively swift flowing river passes over a larger fall, the foam, which has by this time dispersed, is regenerated. Sometimes the foam is more persistent than on other occasions. Approximately 200 m from this second fall is the situation of the third sampling point.

Sampling Point 3 (*Goat*)

Grid ref. TQ 276674

This sampling point is a few metres upstream from where water enters the river through a large concrete drainage pipe. Here the river is some 15 m wide and about 34 cm deep. The bank is covered with nettles and docks and is about one metre higher than the water-level, although upstream the banks are built up higher artificially. Large items of rubbish are dumped here too but the water is frequently so turbid that the bed of the river cannot be seen. The amount of suspended solids at this point always renders the water cloudy and no aquatic plants are visible.

Further downstream the turbid waters flow into the National Trust area known as The Watermeads, past a jute-sack works and soap makers and perfumers. Entering the grounds of Ravensbury Park, the river flows slowly, and suspended solids again cloud the river-bed from view. The use of hired rowing boats occurs on one section of the river here. Leaving the park the river flows over a small weir beside a mill once using water power. Foam is again regenerated, but more extensively than previously. The river flows under Morden Road to enter another area of National Trust land, Morden Hall

Park. Once a deer-park, now a herd of two dozen bullocks graze in these grounds where the Wandle divides into numerous channels. One of the major streams a few metres from where it flows out of the park under the railway line was used for the fourth sampling point.

Sampling Point 4 (*Morden Hall*)

Grid ref. TQ 263689

Trees and shrubs line the banks of this section of the Wandle together with an abundant growth of nettles. This branch of the river is approximately eight metres wide and one metre below the level of the bank in most places. The river itself is about 38 cm deep one metre from the bank. The water is turbid, often completely obscuring the river-bed.

The divided streams unite once more at Phipps Bridge, and the Wandle then flows into Merton on its way to the Thames.

The Method of Study

The sampling points were chosen to a certain extent by virtue of their accessibility and their positions along this stretch of the river. There is a distance of 1.6 km between sampling points 1 and 2, 1.7 km between points 2 and 3, and 3 km separating points 3 and 4. Similar physical characteristics were also looked for in an attempt to eliminate variations other than pollution which might influence the results, such as pH, speed of current, the nature of the river-bed, and the water temperature. However these were difficult to discover.

The pH of the water was measured using Whatman - BDH indicator papers, pH 7.5 being registered at every sampling at all four points. The temperature of the water was measured at each sampling directly above the substratum using either a thermistor or centigrade thermometer, the results being recorded after a standard length of time.

Macan (1963) states that it is unlikely that current has a direct effect on the river-bed unless the latter is unstable. Current diminishes with increasing depth and the substratum is subjected to a distinctly weaker current than that flowing above it. Nevertheless crude attempts were made to measure the speed of flow at each of the sampling points by timing the speed at which a float (a wooden cotton reel) floated downstream over a set measured distance approximately one metre from the bank. The speed in metres per minute was calculated (Table 1). However, considerable fluctuations might be seen to occur on different days and also possibly at different times of day.

TABLE 1. Average speed of current.

Sampling point	Speed in metres/minute
1	12
2	20
3	10
4	20

It was not possible within the scope of this investigation to consider separately the influence of current on the distribution of organisms. This probably depends to a considerable extent on the nature of the substratum (Dowdeswell 1959: 220, Lister 1970).

The substratum is the place where most freshwater animals find their food, while protection from enemies is a second essential requirement. Thus the bed is the most heavily populated area of a river or stream. This was substantiated in the case of the Wandle by preliminary sampling of water and substrata at the four sampling points in April 1970 using a very fine net wielded for a given distance. It was decided for the purpose of this investigation that a qualitative and quantitative study of the fauna of the river-bed would be most profitable, bearing in mind the fact that the nature of the substratum will also affect the species present. The substratum at each sampling point is as follows:

1. The Grove. A mixture of gravelly-sand, mud and scattered stones.
2. Hackbridge. Muddier but still stony and firm, though often coated with "sewage fungus".
3. Goat. Thick deposit of mud and silt with fewer stones.
4. Morden Hall. A layer of mud similar to point 2, also patches of gravelly-sand in places with numerous small stones (about the size of a hazel-nut).

The amount of dead leaves composing the substrata at each of the four sampling points is about the same for each site.

Standard samples of the substratum at each sampling point were collected and compared. A very fine-meshed net was pushed along the substrata perpendicularly to the bank from a distance of approximately two-thirds of a metre until a 500 cc sample had been obtained. This was then searched and the resulting predominance of animals recorded (see below). The nature of the substratum at all but one of the sampling points precluded sampling by taking a core of the bottom, and sampling by means of quadrats (Lister 1970) was not possible. Although, ideally, ten or more samples should have been taken the limited time available for sampling meant that only four samples could be taken at each of the four sampling points at varying intervals.

The first major sampling took place during the first week of September 1970, and a second at the end of December 1970 and the begining of January 1971. Further sampling occurred during February and April 1971. The sampling took place on consecutive days at the same time each day. It is unfortunate that it was impossible to take samples simultaneously at all four points as the results would then be more comparable.

No account was taken in this investigation of the microscopic plankton life of the river or the aquatic vegetation, but casual observations indicated that there is a decline in both from sampling points 1 to 4.

Results

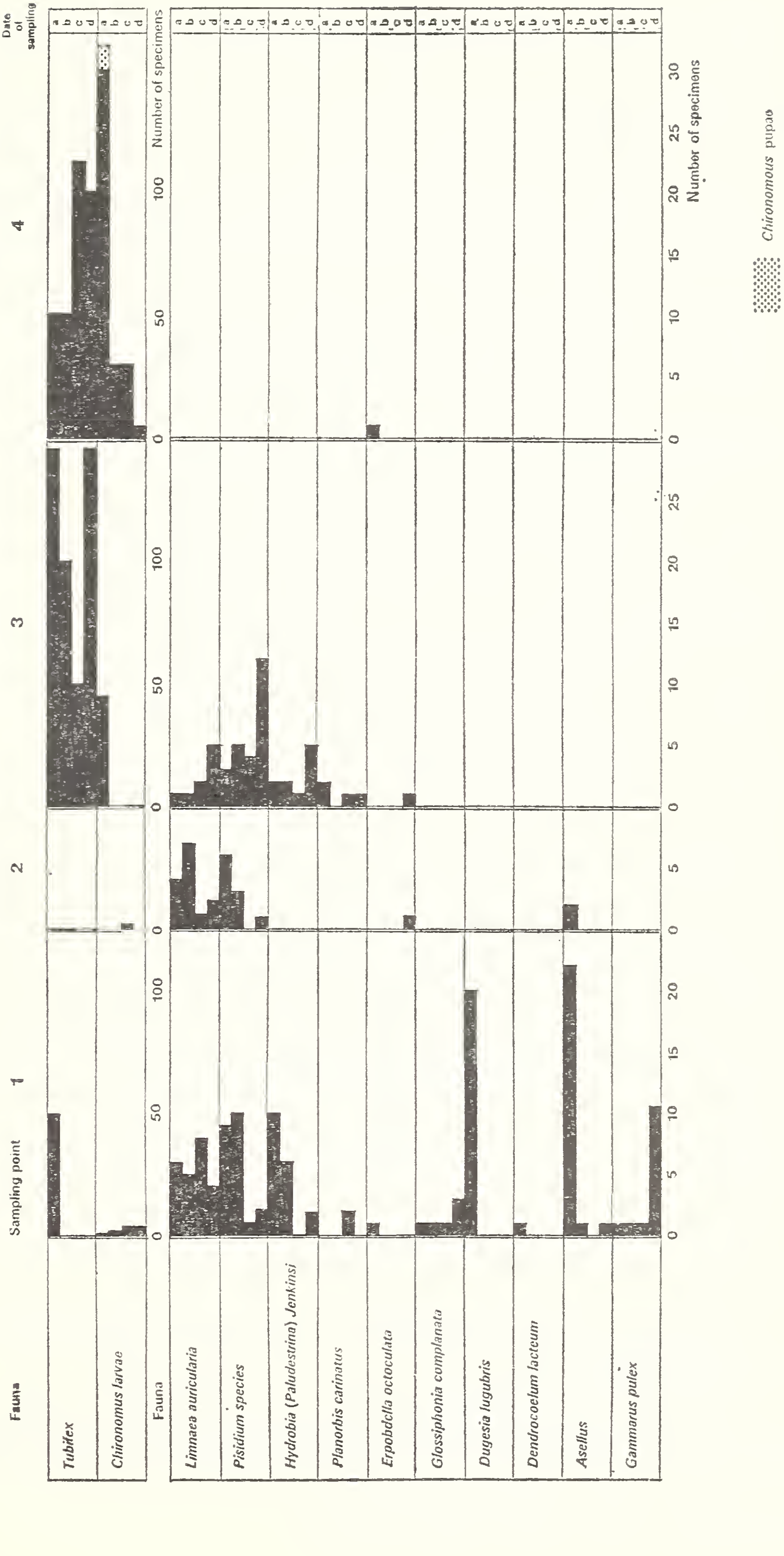
The quantitative results of the samples taken during the different months are shown in Fig. 2. These are obviously subject to human error resulting both from the method of sampling and the way in which the results were compiled. Animals could have been overlooked in the searching of the sample and the numbers of *Tubifex* were estimated due to the large number in samples from points 3 and 4. At each time of sampling both the air temperature and water temperature immediately above the river-bed were recorded (Table 2).

TABLE 2. Temperatures (°C). A=air; W=water.

Month	Sampling Point							
	1		2		3		4	
	A	W	A	W	A	W	A	W
September	20	14	20	15	20	15	20	15·5
December	0	9	0	9	0	5	0	9
February	8	10·5	8	10·5	8	12	8	11·5
April	13	10·5	15	12·5	20	15·2	15	13

Slight fluctuations in temperature are evident. Other changes noticeable at the sampling points in different months include less extensive sewage fungus after September 1970 compared with April 1970 at Hackbridge, and a very strong odour at point 4 in January 1971 and to a lesser extent at point 3. The odour of the mud increases from points 1 to 4. Suspended solid matter in the river varied at the different times of sampling as did the persistence of foaming at the 'weirs' near Goat Bridge and where the river enters Morden Hall Park.

FIG. 2. Quantitative results of samples. Dates of sampling: a, September 1970; b, January 1971; c, February 1971; d, April 1971. The *Chironomus* larvae at point 1 were half colourless and half red, at point 2 they were all colourless, whilst at points 3 and 4 they were all red.



The animal species found at each of the four sampling points are listed below.

Sampling Point 1:

Asellus sp. (water louse)
Chironomus sp. (bloodworm larvae and colourless larvae)
Dendrocoelum lacteus O. F. Müller (flatworm)
Dugesia lugubris O. Schmidt (flatworm)
Erpobdella octoculata (L.) (leech)
Gammarus pulex (L.) (freshwater shrimp)
Glossiphonia complanata (L.) (leech)
Hydrobia (*Paludestrina*) *jenkinsi* E. A. Smith (Jenkins' spire shell)
Limnaea auricularia (L.) (ear-shaped pond snail)
Pisidium sp. (pea-shell cockle)
Planorbis carinatus O. F. Müller (keeled ramshorn)
Tubifex sp. (sludgeworm)

Sampling Point 2:

Asellus sp.
Chironomus sp. (bloodworm and colourless larvae)
Erpobdella octoculata (L.)
Hydrobia (*Paludestrina*) *jenkinsi* E. A. Smith
Limnaea auricularia (L.)
Pisidium sp.

Sampling Point 3:

Chironomus sp. (bloodworm only)
Erpobdella octoculata (L.)
Hydrobia (*Paludestrina*) *jenkinsi* E. A. Smith
Limnaea auricularia (L.)
Pisidium sp.
Planorbis carinatus O. F. Müller
Planorbis contortus (L.) (horn snail)

Sampling Point 4:

Chironomus sp. (bloodworm only)
Erpobdella octoculata (L.)
Tubifex sp.

The average distribution of the fauna in the samples listed above is shown in Fig. 3.

In addition to the listed organisms, a preliminary sampling of the water and substratum in April 1970 revealed the presence of additional organisms as follows:

SAMPLING POINT 1: crustaceans including *Chydoris* sp. and *Cyclops* sp., *Hydra* sp., *Gasterosteus aculeatus* L. (three-spined stickleback) and case-less caddis fly larvae.

SAMPLING POINT 2: *Cyclops* sp., *Gasterosteus aculeatus* L.

SAMPLING POINTS 3 & 4: *Cyclops* sp.

An unidentified annelid was found at all four points. The-three spined stickleback (*Gasterosteus aculeatus* L.) occurs in smaller numbers at point 2 than point 1. In April 1971 six sticklebacks were seen near the outflow drainage pipe downstream from sampling point 3, although they were not observed elsewhere in this section of the river during the period of the investigation. However more were seen in the area during the summer of 1972.

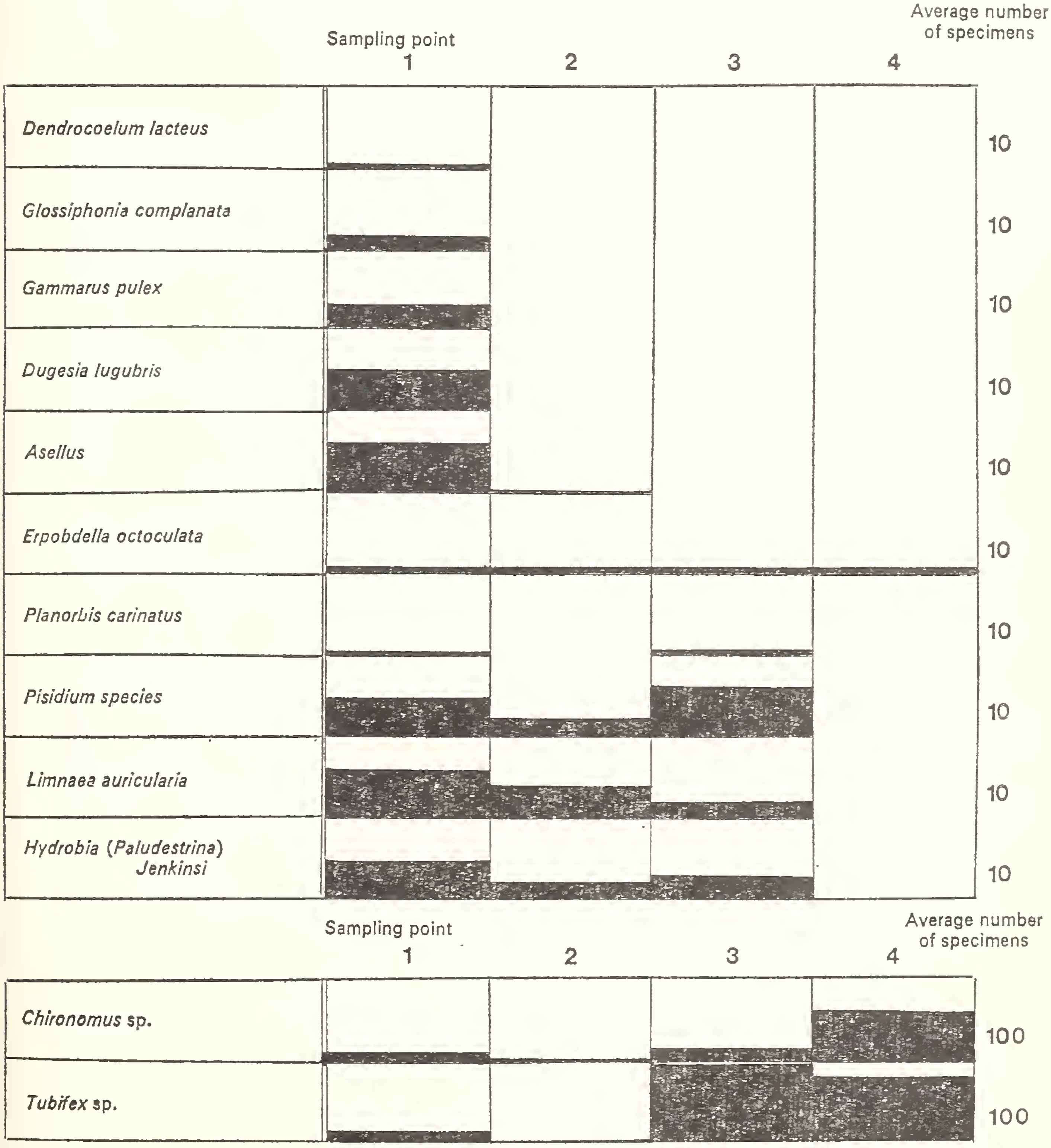


FIG. 3. The average distribution of the fauna in the samples.

Dissolved Oxygen Concentration and its Effect on Selected Animals

Two of the animals dominating the two lower sampling points are the annelid *Tubifex* (the sludgeworm) and the red larvae of the midge *Chironomus* (the bloodworm). Both live in mud tubes and undergo respiratory movements by undulating the body. They also both possess the red pigment haemoglobin. The latter fact, combined with the discovery of a species of *Chironomus* with colourless larvae at the first two sampling points nearer the source of the river, suggests that deoxygenation of the water might be an important factor affecting the distribution of the fauna in the River Wandle. Haemoglobin would be useful in situations of low oxygen concentration as it would enable any oxygen which did happen to be available to be absorbed. Not all animals have active breathing mechanisms or pigments enabling them to adapt to low oxygen concentrations.

Attempts were made to estimate the percentage of oxygen saturation of samples of water from the four different sampling points. Samples of water for this purpose were obtained by filling and sealing jars, with a capacity of 500 cc, under water, preventing atmospheric oxygen being trapped in the jar where it might have entered the sample of water to be tested.

The samples collected were tested using the phenosafranine method of estimating the oxygen concentration of water (Dowdeswell 1959: 45). Sources of error arise in the difficulty of obtaining samples of water of identical concentration to the river water and also include the fact that samples could not be taken simultaneously at all four sampling points. The samples were taken at the same time of day, 14.00 hours, on consecutive days in the first week of April 1971. Another factor affecting the accuracy of the results is that of operator error in performing the phenosafranine test.

The results obtained were compared with a table of figures of the amount of oxygen dissolved by distilled water when saturated with air at different temperatures (Dowdeswell 1959). As the water samples were not all of the same temperature, percentages of saturation were calculated from the average of the results at each sampling point, to enable comparisons to be made between samples.

The results revealed percentages of dissolved oxygen saturation as follows:

Sampling point	Dissolved oxygen per cent saturation
1	100
2	96
3	87
4	80

The behaviour of animals under conditions of reduced oxygenation varies with the species. The effect of different concentrations of dissolved oxygen on two selected animals of the River Wandle, namely *Limnaea auricularia* (the ear-shaped pond snail) and *Tubifex* (the sludgeworm), were studied by the method outlined below.

When the water samples tested for oxygen concentration were taken, numbers of *Limnaea auricularia* were collected from point 1 and established in an aquarium. Similarly *Tubifex*, in mud from point 3, were also collected.

Distilled water was boiled for about ten minutes and allowed to cool under olive oil in a sealed container, in an attempt to deoxygenate the sample and prevent atmospheric oxygen from re-entering. However, when a small sample of this large volume of water was transferred to another container and tested, approximately 25 per cent oxygen saturation was found and this had to be taken into account in the making up of the water samples. Samples of air-saturated distilled water were prepared and mixed with samples of the water at 25 per cent saturation in proportions such that samples of water at 12 °C of 25, 50, 60, 75, 80, 90 and 100 per cent (confirmed by testing a sample of each using the phenosafranine method) of oxygen saturation were obtained. The actual percentages chosen were based to some extent on the results obtained when the samples of water from the four sampling points were tested for dissolved oxygen, and on the figures in the GLC (1967) average analytical results which indicate dissolved oxygen concentrations found at different points along the Wandle.

Two 1000 ml containers were prepared for each percentage of oxygen-saturated water produced by the above method, 100 ml of mud being placed in each. Sludgeworms (*Tubifex*) were present in the mud samples for one of each pair of containers, while five pond snails (*Limnaea auricularia*) of similar sizes were placed on the mud in the bottom of the other containers. The containers were then carefully completely filled with the prepared samples of water, sealed with a transparent lid, and the contents allowed to settle for a few minutes.

The mud was included as *Tubifex* live in this substrate and removal from it might have affected them as well as the oxygen concentration of the water. The physiological condition of animals used in experiments connected with respiration is also important, hence the use, as far as possible, of snails of the same size.

Limnaea auricularia can breathe some dissolved oxygen, but has to supplement this by coming to the surface to obtain oxygen from the air. The time taken for the five snails in each sample to come to the surface to breathe was recorded (Table 3). The average for the five was found, as results varied individually, at each oxygen concentration and the results were plotted on a graph (Fig. 4).

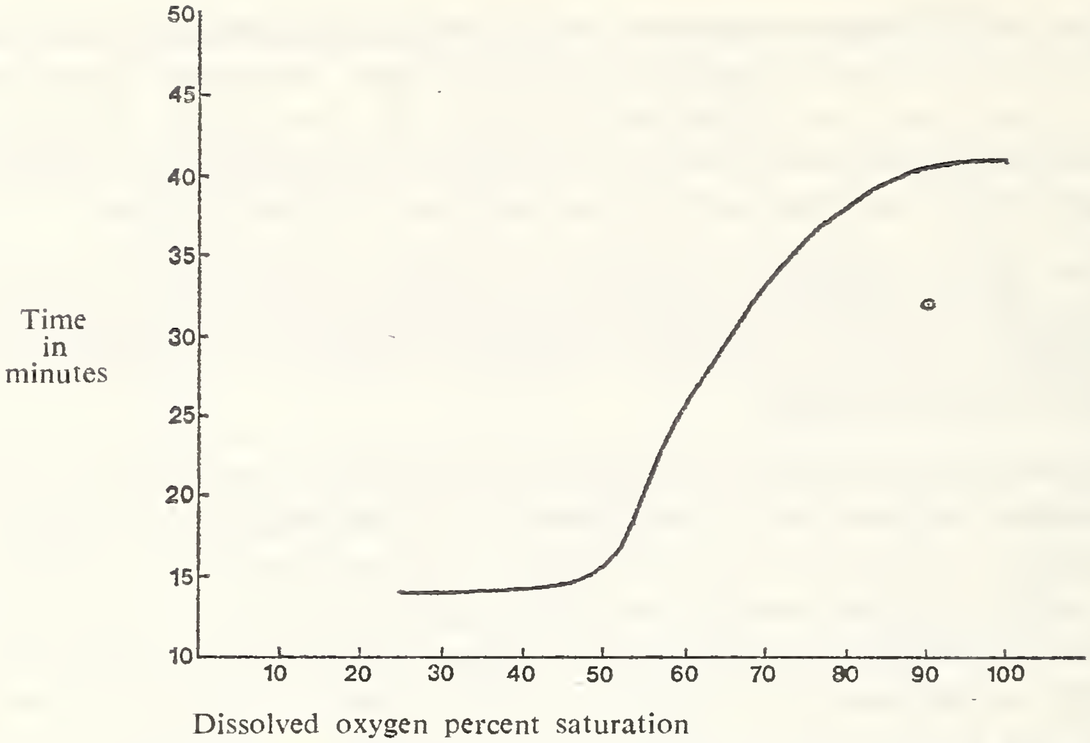


FIG. 4. Average time taken for *Limnaea auricularia* to rise to the surface in water of different percentages of saturation with dissolved oxygen.

TABLE 3. Time taken for snails to come to the surface to breathe.

Percentage oxygen saturation	Actual time (in minutes) taken by snails 1	2	3	4	5
25%	<1	<1	20	20	30
50%	10	10	11	12	30
60%	5	10	25	35	55
75%	18	24	40	40	60
80%	16	20	27	35	61
90%	10	20	31	42	90
100%	23	23	25	35	100

Tubifex breathes directly through the body wall, the hind end of its body projecting into the open water from its tube of mud. The amount of the body of several *Tubifex* which projected into the water of different percentages of oxygen saturation was measured on a transparent scale on the outside of the container. An average result was obtained for each concentration (Fig. 5). The number of body undulations per minute made by several worms as they breathed were also counted for each sample of water and an average of these was plotted (Fig. 6).

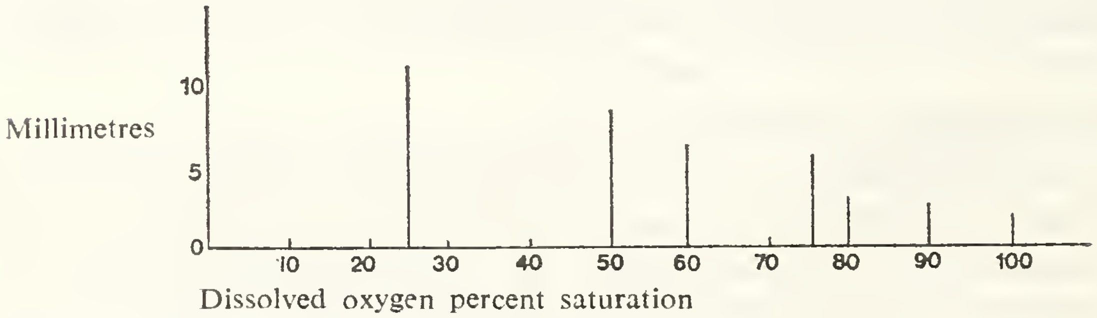


FIG. 5. Height of *Tubifex* body exposed to water.

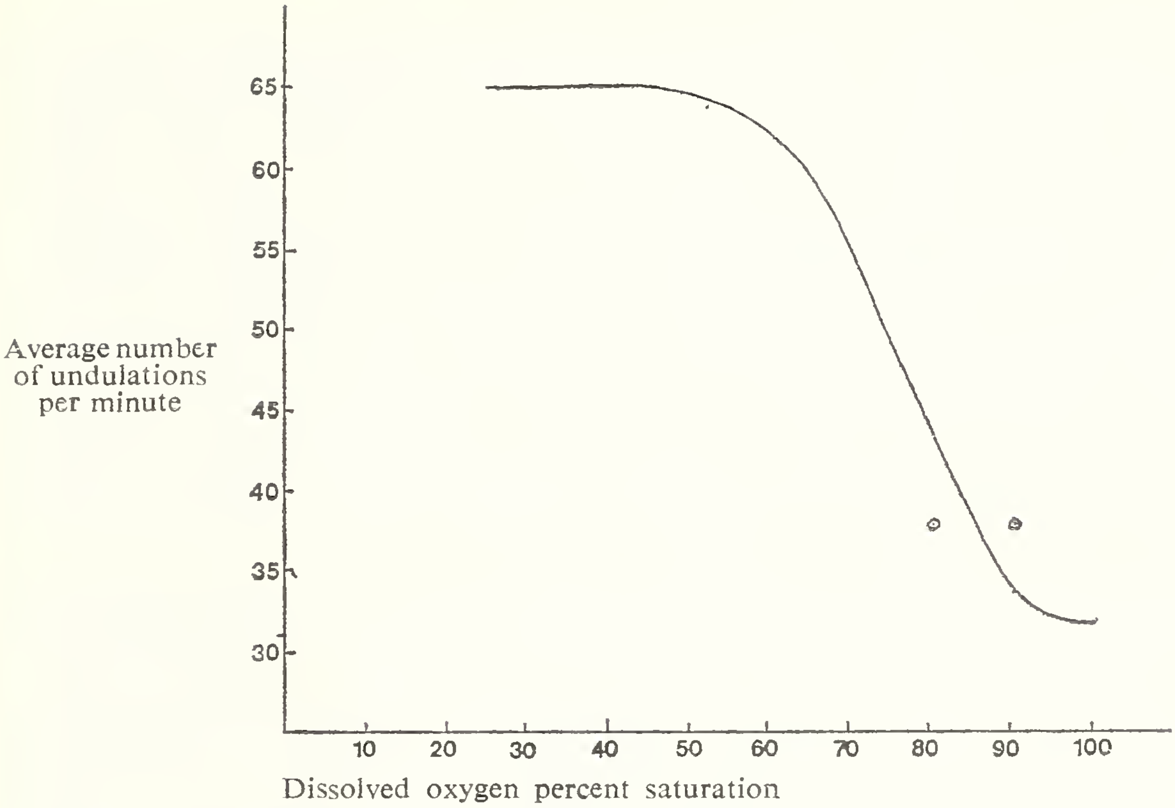


FIG. 6. Average rapidity of body movement in *Tubifex* in water of different percentages of oxygen saturation.

Discussion

It is important to take into account in this investigation, with its limited sampling and opportunities for error, the fact that the results can only indicate certain trends which could be the object of more careful and detailed studies.

From the sampling of the benthos undertaken at each of the four points, the lists compiled revealed a decrease in the number of species from points 1 to 4. Thirteen different taxa were found in the sample at point 1, compared with three at point 4. Quantitative results indicated that different species were dominant at the different sampling points. Molluscs, such as *Limnaea auricularia* and the crustaceans *Asellus* and *Gammarus pulex* are dominant at sampling point 1, and molluscs dominate the fauna of point 2. Molluscs continue to dominate the fauna at point 3, but are joined here by *Tubifex*, the annelid. *Tubifex* is co-dominant with chironomid larvae at point 4. However, how much of this is due to the nature of the substrate and how much to pollution it is impossible to state as the two cannot be considered separately. *Asellus*, the isopod crustacean, sometimes colonizes polluted conditions where there are rotting leaves etc., but the amphipod *Gammarus pulex* habitually lives in purer, well-aerated water. At sampling point 1 they both occur together. Preparation of lists is but an early stage on the way to understanding what a community is like in a particular area and how its components are related.

The physical environment at each of the sampling points was compared. Current speeds probably have little effect on the fauna of this stretch of the river and fluctuations are generally very slight. The same is true of pH. Temperature of the water probably does not directly affect the presence of different species found at the different sampling points as over the course of the year the water at each point reaches a temperature similar to that at another point on a different occasion. However, temperature does exert an effect in that with rising temperature the amount of oxygen in saturated solution goes down, while the demand for oxygen by the increasingly active fauna is greater. Where oxygen saturation is already low due to pollution this can give rise to problems.

Estimations of the percentage saturation of dissolved oxygen at each of the sampling points indicated that oxygen concentration decreases gradually over the distance studied, from 100 per cent at point 1, to 80 per cent at point 4. However, experiments carried out by Gameson and Griffith (Macan & Worthington 1968: 180) show variations in daily maximum, average and minimum values of oxygen which make it quite clear that no reliable idea of the oxygen content of a piece of water can be gained from a few spot samples.

The fact that the oxygen concentration of this stretch of the River is not appreciably lower, considering its polluted state, may possibly be due to the fact that there are numerous 'weirs' and 'falls' along its length, which all serve to increase the concentration of oxygen in water in which it is below saturation.

The GLC average analytical results substantiate the findings of this study, revealing increasing deoxygenation of the waters of the Wandle as it flows towards the Thames. They record an average of 90 per cent oxygen saturation at Goat Bridge which compares favourably with the 87 per cent saturation obtained downstream from there at point 3 in this investigation. The decline in dissolved oxygen will obviously affect any animal life present, but to what extent any changes will be due largely to oxygen concentration and to what extent to the direct effect of the polluting agents (predominantly organic matter) would be hard to decide.

The success of certain animals in a particular habitat is no doubt due to adaptations in behaviour and form. Deoxygenation is a major result of organic pollution. The major pollutant of the river is sewage effluent. Therefore it is organic pollution which is the cause of the biological changes in the water. This fact is substantiated by the work of Lister (1970). In the case of the Wandle the pollution instigated at Carshalton (and Croydon) is added to as the river proceeds to the Thames. Nowhere is there a stretch of the river where its condition is allowed to improve, the pollution merely increasing. This will obviously have serious biological effects.

The pollution of the Wandle must be controlled more strictly in an attempt to restore the condition of the river. It is encouraging that since this investigation was carried out improvements have been made to the sewage works, and the Wimbledon works has been closed. The GLC said in 1972 that the water in the River Wandle was 64 per cent better than in April 1971. There are also plans to put a few hundred fish into the river between Goat Bridge, Carshalton, and Aldwick Road, Beddington, and a small number of roach, perch and dace have already been introduced to find out if they will live and breed there successfully.

I thank Miss B. E. Brewster for redrawing Fig. 1.

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Book Review

Flora of Bexley. By M. C. Foster. 18 pages. London Borough of Bexley, Libraries and Museums Department, Hall Place, Bexley, Kent. 1972. £0.15.

Mrs Foster's booklet is one in a series on different aspects of the Borough of Bexley, which extends from Sidcup to the tideway from Thamesmead to Crayford Ness. It considers in turn each of the habitat types represented, which are much the same as those which might be found in any outer London borough, except for the absence of any chalk grassland, and indicates for each the wild or naturalised plants most likely to be seen or most worthy of note, including any known to be extinct, decreasing or likely to spread. This is all neatly done, and one can only regret that there is no mention of the interesing marshland community of plants at Foots Cray Meadows, a site appearing on her map but nowhere in her text, and which has been the subject of recent attention from other departments of the Borough. This may be because many of its most distinctive members are sedges and grasses, which do not exist for the purposes of the booklet.

R. M. BURTON

The Flora of Perivale Wood Nature Reserve

by K. A. Roberts and P. J. Edwards

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Summary

This paper lists the flowering plants, ferns, fungi, mosses, liverworts and lichens recorded in each of twelve habitats in Perivale Wood Nature Reserve. The habitats include pasture, ungrazed grassland and marsh, an old parish boundary hedge, mature closed-canopy oak-wood, oak-wood clearings, a wet clearing, wet elm woodland, elm woodland edge and an old rubbish dump. Brief details of the nature of each habitat, its soils, history and management are also presented.

Introduction

Perivale Wood Nature Reserve is one of the oldest reserves in Britain. It lies on the London Clay in the Brent Valley at 75–97 ft O.D. (23–30 m) some 14 km W.N.W. of central London in an area that was predominantly rural well into this century, but is now extensively built-up (see Roberts & Edwards 1973). The soil is a non-calcareous surface-water gley (Bache 1962).

The flora of the reserve is of particular interest for several reasons. Historically the pattern of field, parish boundary hedge and pedunculate oak-wood contained in the reserve is probably at least 600 years old, and the wood itself is probably a remnant of the ancient Middlesex forests. Locally woodland is an extremely rare habitat. In the surrounding 14,000 hectares only a very few clumps of large trees can be found, usually with no understorey. Few grasslands in the area now have the diversity of species found in the reserve's grassland.

The reserve also has a history of research on its flora. Webb (1911) referred to some species of flowering plants in the wood, and Shenstone (1913) listed 64 species. Groves (1962) listed 193 species of flowering plants and ferns, 38 fungi and 22 bryophytes and lichens, with frequency estimates for the flowering plants and notes on habitats. Species lists for various habitats were also drawn up for the period 1965–1972 (Edwards & Roberts, unpublished). The history and management of the various habitats are also relatively well-documented (e.g. Roberts & Edwards 1973) and the soils have been surveyed in some detail (Bache 1962). An increasing number of students are now looking at the vegetation.

The current survey is based on a quantitative approach which makes it more amenable to comparisons with habitats elsewhere, and also separates a number of habitats previously grouped together by other authors. The variety of the habitats is shown in Fig. 1. The presentation is based on habitats rather than species, because although the former are necessarily somewhat more arbitrary in definition, they seem to present a more useful basis for further ecological studies.

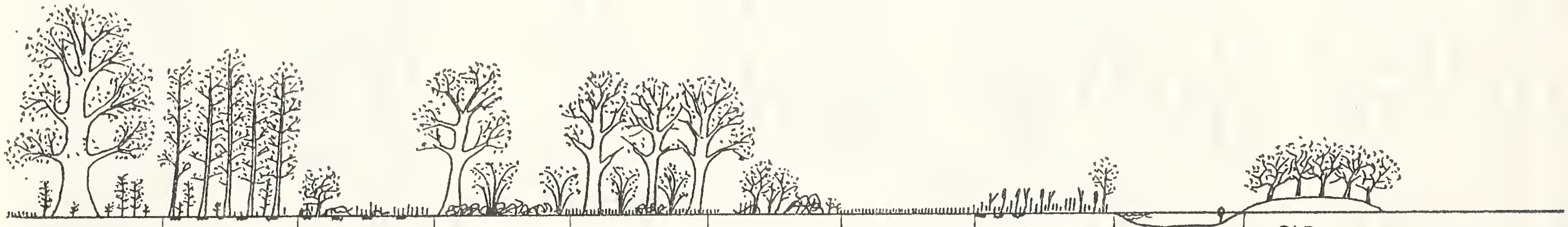
The usefulness of the reserve for studies of vegetation change or for comparative studies with other areas is enhanced by the fact that the site is considerably more secure than most, being the freehold property of a natural history society as well as an SSSI, and hopefully it will receive further protective status in the future.

Methods

Habitats were recognised on the basis of soil conditions, vegetation height, and in woodland by the dominant tree species (see Figs. 1 & 2).

For flowering plants and ferns shoot frequency (Greig-Smith 1957) was measured in each habitat in terms of presence or absence per quadrat. 25 cm x 25 cm quadrats were used in the pasture but elsewhere observers estimated the size of 50 cm x 50 cm quadrats. Quadrats were either placed regularly along transects or located remotely so as to reduce observer bias in site selection. The data were then split into six frequency classes (Fig. 3) thus allowing less quantitative estimates to be incorporated where necessary. Extensive subsequent checks indicated that similar surveys or estimates from different observers were never more than one category removed from the original placing for any species.

FIG. 1. Statistical table of the flora and habitats in the reserve.



ELM WOOD EDGE	WET ELM WOOD	WET CLEARING	OAKWOOD CLEARINGS	CLOSE–CANOPY OAKWOOD	WOOD BOUNDARY HEDGE a	WOOD BOUNDARY HEDGE b	PASTURE	PONDFIELD	PONDS & STREAMS	OLD RUBBISH DUMP	
5·1	6·4	7·2	3·8	3·9	–	4·5	5·4	7·0	7·2	6·4	pH
–	6·5	6·5	–	3·3	–	–	5·1	–	–	–	pH (BACHE 1962)
0·4	0·04	0·01	1·2	5·5	0·1	0·2	2·0	0·4	–	0·8	HECTARES
31	22	35	26	33	29	64	84	100	11	43	FL. PLANTS
–	–	1	1	1	–	2	3	1	–	1	FERNS
43	27	14	34	101	8	6	25	20	–	31	FUNGI
5	6	4	6	7	–	4	3	3	–	14	MOSSES
–	–	1	2	2	–	–	–	4	–	1	LIVERWORTS
–	–	1	1	3	–	–	–	3	–	–	LICHENS

"(Intro.)" is used to indicate species whose occurrence in that habitat is believed to be due to deliberate human introduction.

The lists of flowering plants and ferns are based on fieldwork during 1973. The other groups include records going back to 1961, though all but a very few species have been recorded more recently as well. No records after September 1973 are included. Records of slime-moulds are mainly from Ing (1965).

Two areas (see Fig. 2) were excluded from the frequency survey because of recent extensive management work. Species found in these areas but not elsewhere are listed under miscellaneous habitats.

Nomenclature follows D. H. Kent's revisions in Keble Martin (1969) for flowering plants and Lange & Hora (1965) for fungi but with some revisions by D. N. Pegler.

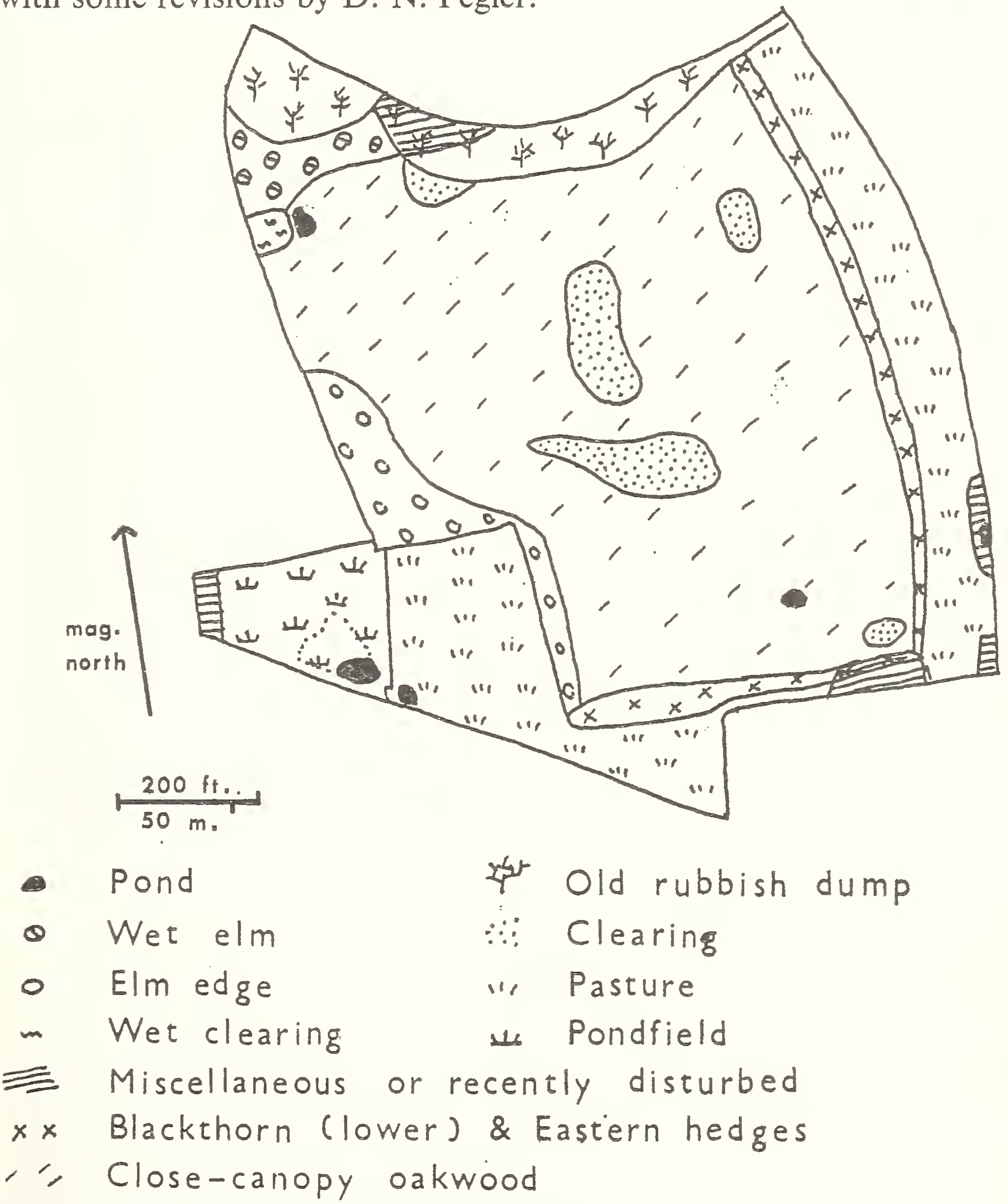


FIG. 2. Map of the reserve showing habitats.

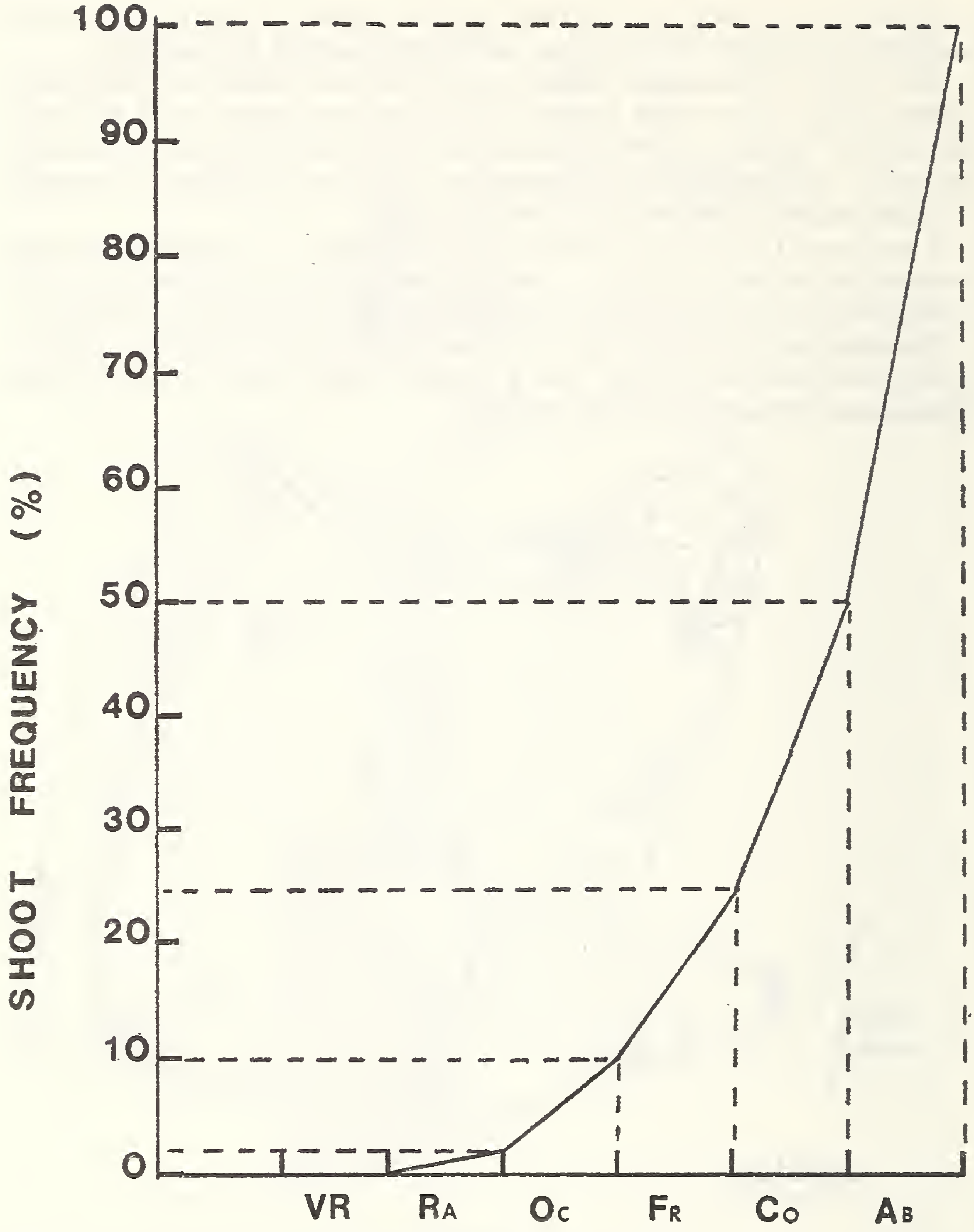


FIG. 3. The frequency categories used in the survey.

Habitats

Pasture

The pasture consists of three fields totalling about 2 hectares (5 acres). They represent the remains of fields which are at least 200 years old and are probably three times that age or more. The land-use history of the area suggests they may have been largely used for corn before 1700 and for hay afterwards. These are grazed by up to six horses between April and October and rested over the winter.

They have probably been pasture throughout this century. *Cirsium arvense* and any *Senecio erucifolius* are scythed down each year. Grass seed was reportedly distributed in the autumn in the years just after the Second World War. Parts of the pastures are damp throughout the year and other areas often become very wet at times. The soil is a mull humus, and the surface soil (A_1 horizon) has a pH of 5.1, organic carbon 6.7% and nitrogen 0.5% (Bache 1962). Twelve surface pH measurements in 1973/74 gave readings of 5.3–5.4, with up to 7.1 locally.

The plant list is based mainly on a series of 98 25 cm x 25 cm quadrats in the eastern pasture, but it was also checked against the results of 440 similar quadrats of non-graminaceous species only in all the pastures.

Such species as *Ulmus procera*, *Crataegus monogyna*, *Prunus spinosa* and *Urtica dioica* are confined to the edges of the pasture.

Ab. (51—100%) *Cynosurus cristatus, Holcus lanatus, Lolium perenne, Ranunculus acris, R. repens, Trifolium repens.*

Co. (26—50%) *Agrostis tenuis, Bellis perennis, Festuca rubra, Poa trivialis.*

Fr. (11—25%) *Alopecurus pratensis, Anthoxanthum odoratum, Cerastium fontanum, Cirsium arvense, Festuca pratensis, Hordeum secalinum, Montia fontana, Prunella vulgaris, Sagina procumbens.*

Oc. (2—10%) *Agrostis stolonifera, Alopecurus geniculatus, Calystegia* sp., *Cardamine pratensis, Equisetum arvense, E. palustre,* x *Festulolium loliaceum, Juncus articulatus, Leontodon taraxacoides, Lotus corniculatus, L. uliginosus, Luzula campestris, Ophioglossum vulgatum, Phleum bertolonii, Plantago major, Poa annua, Rumex acetosa, Taraxacum officinale* agg., *Trifolium dubium, T. medium, T. micranthum, T. pratense, Ulmus procera, Urtica dioica.*

Ra. (0—1%) *Achillea millefolium, Agropyron repens, Ajuga reptans, Alliaria petiolata, Arrhenatherum elatius, Bromus sterilis, Centaurea nigra, Cirsium vulgare, Convolvulus arvensis, Crataegus monogyna, Dactylis glomerata, Deschampsia cespitosa,* x *Festulolium braunii, Galium aparine, Holcus mollis, Leontodon autumnalis, Lysimachia nummularia, Prunus spinosa, Rumex obtusifolius, R. sanguineus, Senecio erucifolius, Trisetum flavescens, Tussilago farfara, Veronica chamaedrys, V. serpyllifolia.*

VR. *Bromus erectus, Cerastium glomeratum, Chrysanthemum leucanthemum, Epilobium hirsutum, Heraclium sphondylium, Juncus bufonius, Lathyrus pratensis, Lychnis flos-cuculi, Lycopus europaeus, Mentha spicata* (Intro.), *Polygonum aviculare, P. persicaria, Potentilla reptans, Pulicaria dysenterica, Quercus robur, Rubus fruticosus* agg., *Silene dioica, Stellaria graminea.*

FUNGI

ASCOMYCOTINA

Peziza repanda.

BASIDOMYCOTINA

Agaricus arvensis, A. bitorquis, Agrocybe vervacti, Cantharellula cyathiformis, Clitocybe fragrans, Coprinus atramentarius, C. comatus, C. niveus, C. plicatilis, Galerina graminea, Gloeocystidium praetermissum, Hygrophorus pratensis, Marasmius graminum, M. oreades, Panaeolus campanulatus, P. fimicola, P. foenisecii, P. semiovatus, P. sphinctrinus, P. subbalteatus, Psathyrella candolleana, Stropharia coronilla, S. merdaria, Tubaria furfuracea.

MOSSES

Acrocladium cuspidatum, Brachythecium rutabulum, Pottia truncata.

Pondfield

The Pondfield covers about 0.4 hectares (1 acre). It was grazed pasture until 1958 when it was fenced off. At the same time a large pond was dug there. Subsequently many species of plants were introduced into the habitat by human agency. Bache (1962) did not differentiate the soil in the Pondfield from the other pastures. 10 surface pH measurements in 1973/74 gave a range of 5.4 to 7.5, with a mean of 7.0. The Pondfield could in fact be subdivided into a number of smaller habitats. Those which appear particularly distinct are the edges, supporting most of the woody plants, a relatively dry stand dominated by *Cirsium arvense* and various grasses, a stand of *Phragmites australis* in the old pond area, and almost monospecific stands of *Epilobium hirsutum* and of *Glyceria maxima.* Large parts of the area are permanently waterlogged, but large parts of the erstwhile pond are now so choked with vegetation that they are drier than the area outside. As no clear division could now be made between the old pond and the old pasture they were treated as one habitat.

The plant list is based on a series of 94 estimated 50 cm x 50 cm quadrats, and checked against another series of 40 over part of the area.

Ab.	(51—100%) *Epilobium hirsutum.*
Co.	(26—50%) *Cirsium arvense, Glyceria maxima.*
Fr.	(11—25%) *Alopecurus pratensis, Epilobium adenocaulon x parviflorum, Holcus lanatus, Lycopus europaeus, Ranunculus repens, Rubus fruticosus* agg., *Rumex sanguineus, Typha latifolia* (Intro.), *Urtica dioica.*
Oc.	(2—10%) *Agropyron repens, Agrostis tenuis, A. stolonifera, Alisma plantago-aquatica, Anthriscus sylvestris, Apium nodiflorum, Arrhenatherum elatius, Carex otrubae, C. riparia, C. spicata, Crataegus monogyna, Deschampsia cespitosa, Dipsacus fullonum, Dryopteris dilatata, Epilobium angustifolium, Festuca pratensis, F. rubra, Galium aparine, Glechoma hederacea, Heracleum sphondylium, Iris pseudacorus* (Intro.), *Juncus effusus, Lathyrus pratensis, Lemna minor, Nasturtium microphyllum* x *officinale, Phragmites australis, Plantago major, Poa trivialis, Quercus robur, Ranunculus acris, Rumex acetosa, R. obtusifolius, Salix babylonica* (Intro.), *S. fragilis* (Intro.), *S. viminalis* (Intro.), *Solanum dulcamara, Tussilago farfara, Ulmus procera.*
Ra.	(0—1%) *Achillea millefolium, Agrimonia eupatoria, Alnus glutinosa* (Intro.), *Alopecurus geniculatus, Arctium minus agg., Artemisia vulgaris, Aster novi-belgii* (Intro.), *Bromus ramosus, Caltha palustris* (Intro.), *Calystegia sepium, Cardamine pratensis, Centaurea nigra, Cerastium fontanum, Cirsium vulgare, Epilobium adenocaulon, E. parviflorum, Glyceria plicata, Hedera helix, Hordeum secalinum, Juncus articulatus, J. inflexus, Lonicera periclymenum, Nasturtium officinale, Petasites hybridus* (Intro.), *Phleum bertolonii, Picris echioides, Populus nigra* (Intro.), *Polygonum persicaria, Potentilla reptans, Prunus spinosa, Rorippa amphibia, Rumex conglomeratus, Silene dioica, Sonchus arvensis, S. asper, Trifolium repens, Veronica chamaedrys.*

VR. *Aesculus hippocastanum*, *Ajuga reptans*, *Berberis vulgaris* (Intro.), *Betula pendula* (Intro.), *Cotoneaster simonsii* (Intro.), *Endymion non-scriptus*, *Geranium dissectum*, *Lysimachia punctata*, *Populus tremula* (Intro.), *Primula veris* (Intro.), *P. vulgaris* (Intro.), *Trisetum flavescens*, *Ulex europaeus* (Intro.).

FUNGI

BASIDOMYCOTINA

Agaricus arvensis, *Agrocybe praecox*, *A. vervacti*, *Auricularia auricula*, *Boletus chrysenteron*, *B. testaceoscaber*, *Coprinus atramentarius*, *C. micaceus*, *Fistulina hepatica*, *Inocybe napipes*, *I. pyriodora*, *Panaeolus campanulatus*, *Pleurotus cornucopiae*, *P. ostreatus*, *Pluteus umbrosus*, *Polyporus squamosus*, *Puccinia poarum*, *Stropharia aeruginosa*, *S. coronilla*, *Volvariella bombycina*.

LIVERWORTS

Lophocolea cuspidata, *Pellia epiphylla*, *Riccardia pinguis*, *R. sinuata*.

MOSSES

Acrocladium cuspidatum, *Brachythecium rutabulum*, *Pottia truncata*.

LICHENS

Cladonia coniocraea, *Lecanora conizaeoides*, *Lecidea granulosa*.

Eastern Hedge

The 335 m (1100 ft) long eastern hedge is part of the ancient broad hedge marking the parish boundary between Greenford and Perivale. Perivale Wood is referred to as the Broad Hedge Wood as early as 1298 (E. P. H. Pugh, pers. comm.), which suggests the hedge is at least 700 years old. The average of seven woody plant species per 30 yd stretch suggests a similar age (see Hooper 1971a). The hedge has spread into the pasture in parts, and there are three gaps in it, generally where large oaks are overhanging. Parts have been layered since 1965 but much more needs to be done if it is to be maintained as a hedge. Seventeen measurements of surface pH in 1973/74 gave a range of 3.3–7.1 and a mean of 4.5.

The plant list is based on 96 estimated 50 cm x 50 cm quadrats, half made along the woodland side of the hedge and half along the pasture side.

Ab. (51—100%) *Prunus spinosa*, *Rubus fruticosus* agg.

Co. (26—50%) *Crataegus monogyna* (+hybrids).

Fr. (11—25%) *Cirsium arvense*, *Endymion non-scriptus*, *Holcus lanatus*, *H. mollis*, *Milium effusum*, *Poa trivialis*, *Quercus robur*, *Rosa arvensis*, *Rumex sanguineus*, *Silene dioica*, *Ulmus procera*, *Urtica dioica*.

Oc. (2—10%) *Agrostis tenuis*, *Alopecurus pratensis*, *Bryonia dioica*, *Calystegia sepium*, *Cerastium fontanum*, *Fraxinus excelsior*, *Hedera helix*, *Ligustrum vulgare*, *Lycopus europaeus*, *Lysimachia nummularia*, *Malus sylvestris*, *Milium effusum*, *Poa annua*, *P. nemoralis*, *Rumex obtusifolius*, *Sambucus nigra*, *Stellaria holostea*, *Swida sanguinea*, *Tamus communis*, *Viola riviniana*.

Ra. (0—1%) *Acer campestre, Cardamine pratensis, Circaea lutetiana, Corylus avellana, Deschampsia cespitosa, Epilobium angustifolium, Equisetum arvense, Euonymus europaeus, Filipendula ulmaria, Galium aparine, Geum urbanum, Hieracium* sp., *Juncus effusus, Lamium album, Lonicera periclymenum, Phleum bertolonii, Ranunculus repens, Solanum dulcamara, Sorbus aucuparia, Trifolium repens.*

VR. *Atriplex hastata, Brachypodium sylvaticum, Glyceria plicata, Heracleum sphondylium, Rubus laciniatus, Rumex acetosa, Salix caprea, Scrophularia nodosa, Stellaria graminea, Taraxacum officinale* agg., *Tussilago farfara.*

FUNGI

ASCOMYCOTINA

Ceratocystis ulmi, Daldinia concentrica.

BASIDOMYCOTINA

Auricularia auricula, Fistulina hepatica, Lycoperdon giganteum, Trametes versicolor.

MOSSES

Atrichum undulatum, Aulacomnium androgynum, Dicranella heteromalla, Mnium affine.

Blackthorn Hedge

The blackthorn hedge along the southern border of the wood is now more of a dense thicket than a hedge in parts. Aerial photographs indicate that it has spread into the adjacent pasture considerably over the past 25 years. It contains considerably fewer species than the eastern hedge.

The plant list is based on 26 estimated 50 cm x 50 cm quadrats along the pasture side of the western half, and more subjective observations of the eastern half and woodland side.

Ab. (51—100%) *Crataegus monogyna, Prunus spinosa.*

Co. (26—50%) *Rubus fruticosus* agg., *Urtica dioica.*

Fr. (11—25%) *Holcus lanatus, Poa trivialis, Stellaria holostea.*

Oc. (2—10%) *Agrostis tenuis, Alopecurus pratensis, Endymion non-scriptus, Quercus robur, Rosa arvensis, Rosa canina, Rumex sanguineus, Ulmus procera.*

Ra. (0—1%) *Cerastium fontanum, Euonymus europaeus, Milium effusum, Poa nemoralis, Prunella vulgaris, Ranunculus acris, Rubus laciniatus, Sambucus nigra, Silene dioica, Trifolium repens.*

VR. *Arrhenatherum elatius, Hieracium* sp., *Lonicera periclymenum, Rumex obtusifolius.*

FUNGI

BASIDOMYCOTINA

Agaricus bitorquis, Entoloma clypeatum, Hygrophorus coccineus, Stereum hirsutum, Stropharia aeruginosa, Trametes versicolor, Tricholoma gambosum, Tubaria conspersa, T. furfuracea.

Mature Closed-canopy Oak-wood

The mature closed-canopy oak-wood covers about 5·5 hectares (13·5 acres). A number of sawn stumps indicate selective felling in the past. Sporadic coppicing of the hazel *Corylus avellana* has occurred, and the undergrowth has been drastically thinned in some areas to produce scenic vistas. For many years dead wood was collected up and burnt, and fallen trees or bushes were removed. At least one tree once supported a large plant of ivy *Hedera helix* but this has been chopped through at the base.

The soil is a moder humus with a distinctive A_2 horizon; the surface soil (A_1 horizon) has a pH of 3·3 and lower horizons are also very acid. The organic carbon content is 26·5% and nitrogen content 1·4% (Bache 1962). Twenty-one measurements of surface pH in 1973/74 gave a range of 3·1–4·6, with a mean of 3·9.

The plant list is based on 30 estimated 50 cm x 50 cm quadrats and extensive observation.

Ab. (51—100%) *Corylus avellana, Endymion non-scriptus, Quercus robur. Rubus fruticosus* agg.

Co. (26—50%) *Crataegus monogyna* (+hybrids).

Fr. (11—25%)-

Oc. (2—10%) *Acer campestre, Fraxinus excelsior, Ilex aquifolium, Lonicera periclymenum, Malus sylvestris, Sambucus nigra, Sorbus torminalis, Viburnum opulus.*

Ra. (0—1%) *Anemone nemorosa* (Re-intro.), *Arum maculatum, Crataegus laevigata* (+hybrids), *Dryopteris dilatata, Epilobium hirsutum, Milium effusum, Narcissus pseudo-narcissus* (Intro.), *Poa annua, Populus tremula, Primula vulgaris* (Re-intro.), *Prunus avium, P. spinosa, Silene dioica, Sorbus aucuparia, Swida sanguinea, Ulmus procera.*

VR. *Acer pseudoplatanus, Betula pendula, Hieracium* sp., *Plantago major, Rubus laciniatus.*

FUNGI

DEUTEROMYCOTINA

Sepedonium chrysospermum.

MYXOMYCETES

Arcyria cinerea, A. denudata, A. ferruginea, A. nutans, A. pomiformis, Comatricha nigra, Craterium minutum, Diderma montanum, D. testaceum, Didymium clavus, D. iridis, D. squamulosum, Fuligo septica, Lycogala epidendrum, Physarum cinereum, P. leucophaeum, P. nutans, Reticularia lycoperdon, Stemonitis fusca, Trichia botrytis, T. persimilis.

ASCOMYCOTINA

Bulgaria inquinans, Calycella citrina, Daldinia concentrica, Nectria cinnabarina, Peziza petersii, P. repanda, Xylosphaera hypoxylon.

BASIDOMYCOTINA

Agaricus augustus, Agrocybe praecox, Amanita fulva, A. pantherina, Armillaria mellea, Auricularia auricula, Boletus chrysenteron, B. subtomentosus, Clitocybe brumalis, C. infundibuliformis, C. nebularis, Collybia confluens, C. erythropus, C. fusipes, C.

maculata, C. peronata, Coprinus atramentarius, C. micaceus, C. plicatilis, Corticium comedens, Dacrymyces deliquescens, Daedalea quercina, Daedaleopsis confragosa, Fistulina hepatica, Grifola frondosa, G. sulphurea, Gymnopilus penetrans, Gyroporus castaneus, Hydnum repandum, Hyphoderma tenue, Hypholoma fasciculare, Hypochnicium punctulatum, Laccaria laccata, Lactarius quietus, L. rufus, Lycoperdon giganteum, L. pyriforme, Lyophyllum decastes, Merulius rufus, M. tremellosus, Mycena alcalina, M. galericulata, M. inclinata, M. vitilis, Myxarium nucleatum, Oudemansiella radicata, Panellus serotinus, Paxillus involutus, Peniophora cinerea, Phellinus ferreus, Phlebia merismoides, Phragmidium violaceum, Pleurotus dryinus, Pluteus cervinus, Psathyrella candolleana, P. conopilea, P. gracilis, Russula aeruginea, R. atropurpurea, R. emetica, R. foetans, R. heterophylla, R. lepida, R. ochroleuca, R. pectinata, R. sororia, Scleroderma aurantium, Stereum hirsutum, Trametes betulina, T. versicolor, Tricholomopsis platyphylla, Xylodon versiporus.

LIVERWORTS

Lophocolea cuspidata, L. heterophylla.

MOSSES

Atrichum undulatum, Aulacomnium androgynum, Dicranella heteromalla, Eurhynchium praelongum, Hypnum cupressiforme, Mnium hornum, Tetraphis pellucida.

LICHENS

Cladonia coniocraea, Lecanora conizaeoides, Lecidea granulosa.

Oak-wood Clearings

The oak-wood clearings are areas with intermittent or no tree canopy above them, and cover about 1·2 hectares (3 acres). Three were made some time prior to the 1950s. A few oaks have been felled since 1965 to make two further clearings. The soils are presumably similar to the rest of the woodland. Nine measurements of surface pH in 1973/74 gave a range of 3·4–4·2, with a mean of 3·8.

The plant list is based on 30 estimated 50 cm x 50 cm quadrats and extensive observation.

Ab. (51—100%) *Endymion non-scriptus, Rubus fruticosus* agg.

Co. (26—50%) *Corylus avellana, Quercus robur.*

Fr. (11—25%) *Crataegus monogyna* (+hybrids), *Epilobium angustifolium, E. hirsutum, Populus tremula, Prunus spinosa, Urtica dioica.*

Oc. (2—10%) *Fraxinus excelsior, Poa annua, Sorbus aucuparia.*

Ra. (0—1%) *Agrostis tenuis, Circaea lutetiana, Cirsium arvense, Dryopteris dilatata, Hieracium* sp., *Impatiens glandulifera* (Intro.), *Milium effusum, Ribes rubrum, Rubus idaeus, Rumex sanguineus, Scrophularia nodosa, Silene dioica, Stellaria media.*

FUNGI

MYXOMYCETES

Arcyria ferruginea, Leocarpus fragilis.

ASCOMYCOTINA

Bulgaria inquinans, Cudoniella clavus.

BASIDOMYCOTINA

Agrocybe praecox, Clitocybe fragrans, C. nebularis, Collybia fusipes, C. maculata, Corticum comedens, Fistulina hepatica, Grifola sulphurea, Hypholoma fasciculare, Inocybe napipes, Lactarius quietus, L. rufus, L. subdulcis, Laetiporus sulphureus, Lepista nuda, Mycena galopus, M. vitilis, Phallus impudicus, Phlebia radicata, Phragmidium violaceum, Pleurtus ostreatus, Psathyrella hydrophila, Russula atropurpurea, R. emetica, R. fellea, Scleroderma aurantium, Stereum hirsutum, S. rugosum, Trametes versicolor, Tubaria furfuracea.

LIVERWORTS

Lophocolea cuspidata, L. heterophylla.

MOSSES

Dicranella heteromalla, Eurhynchium praelongum, Fumaria hygrometrica, Mnium hornum, Pohlia nutans, Polytrichum formosum.

LICHENS

Lecidea granulosa.

Wet Clearing

The wet clearing covers about 10 sq. m (ca 100 sq. ft) on the west edge of the wood. A stream runs through it and the area is waterlogged throughout the year. The soil here differs from the rest of the wood; there is no distinct A_2 horizon and the surface (A_1 horizon) pH is 6·5, with organic carbon 14·3% and nitrogen 0·9% (Bache 1962). Seven measurements of surface pH in 1973/74 gave a range of 6·9–7·5, with a mean of 7·2.

The plant list is based on 30 estimated 50 cm x 50 cm quadrats, supplemented by other observations.

Ab.	(51—100%) *Impatiens glandulifera* (Intro.), *Urtica dioica.*
Co.	(26—50%) *Lycopus europaeus, Glechoma hederacea, Rumex sanguineus.*
Fr.	(11—25%) *Epilobium angustifolium, Fraxinus excelsior, Ranunculus repens, Rubus fruticosus* agg., *Silene dioica, Solanum dulcamara, Ulmus procera.*
Oc.	(2—10%) *Ajuga reptans, Callitriche* sp. cf. *stagnalis, Cardamine flexuosa, Carex remota, Circaea lutetiana, Cirsium arvense, Populus tremula, Salix cinerea, Sambucus nigra, Stachys sylvatica.*
Ra.	(0—1%) *Callitriche* sp. cf. *hamulata, Calystegia* sp., *Carex riparia, Corylus avellana, Dryopteris dilatata, Epilobium adenocaulon, Juncus effusus, Milium effusum, Prunella vulgaris, Quercus robur, Scrophularia nodosa, Scutellaria galericulata.*
VR.	*Carex pendula, Ranunculus acris, Ribes nigrum.*

FUNGI

ASCOMYCOTINA

Peziza repanda.

BASIDOMYCOTINA

Boletus chrysenteron, Clavulina cinerea, Collybia peronata, Coprinus atramentarius, Geastrum striatum, Grifola sulphurea, Hebeloma crustuliniforme, Hydnum repandum, Laccaria laccata, Psathyrella spadiceogrisea, Ramaria (*botrytis*), *Russula atropurpurea, Scleroderma aurantium.*

LIVERWORTS

Lophocolea heterophylla.

MOSSES

Fissidens bryoides, Mnium hornum, M. undulatum, Plagiothecium sylvaticum.

LICHENS

Cladonia coniocraea.

Wet Elm Woodland

The wet elm woodland covers about 0·04 hectares (c. 0·1 acres) in the north-west corner of the wood. It is traversed by streams, is generally wet underfoot and has a closed canopy of elm *Ulmus procera.* The soil is probably similar to the wet woodland clearing. Ten measurements of surface pH in 1973/74 gave a range of 5·7–7·5, with a mean of 6·4.

The plant list is based on 20 estimated 50 cm x 50 cm quadrats supplemented by other observations.

Ab.	(51—100%) *Sambucus nigra, Ulmus procera, Urtica dioica.*
Co.	(26—50%) *Cardamine flexuosa, Glechoma hederacea, Silene dioica.*
Fr.	(11—25%) *Crataegus monogyna, Rubus fruticosus* agg., *Rumex sanguineus.*
Oc.	(2—10%) *Poa trivialis.*
Ra.	(0—1%) *Apium nodiflorum, Arum maculatum, Endymion non-scriptus, Hedera helix, Heracleum sphondylium, Impatiens glandulifera* (Intro.), *Milium effusum, Poa annua, Solanum dulcamara.*
VR.	*Carex riparia, Epilobium* sp., *Sorbus torminalis.*

FUNGI

MYXOMYCETES

Didymium squamulosum, Lycogala epidendrum

ASCOMYCOTINA

Daldinia concentrica, Nectria cinnabarina, Peziza repanda, P. micropus, Xylosphaera hypoxylon.

BASIDOMYCOTINA

Armillaria mellea, Auricularia auricula, Coprinus disseminatus, C. micaceus, C. radians, Crucibulum vulgare, Flammulina velutipes, Geastrum striatum, Hydnum repandum, Hypoxylon fragiforme, Mycena galericulata, M. inclinata, M. tenerrima, Pleurotus ulmarius, Pluteus pearsonii, Polyporus squamosus, Psathyrella spadiceo-grisea, Ramaria (*botrytis*), *Russula atropurpurea, R. ochroleuca, Sparassis laminosa.*

MOSSES

Atrichum undulatum, Fissidens bryoides, Mnium affine, M. hornum, M. undulatum, Plagiothecium denticulatum.

Elm Woodland Edge

The elm woodland edge occurs in the south-east corner of Perivale Wood and occupies about 0·4 hectares (1 acre). It is dominated by a number of large elms *Ulmus procera* and many younger ones and sucker shoots. Lower branches and suckers along the edges of the pasture have been thinned to let more light in at times during the 1960s. To the north the elm area extends deeper into the wood and contains fewer species of flowering plants. Fourteen measurements of surface soil pH in 1973/74 gave a range of 3·7–7·2, with a mean of 5·1. pH is consistently lower at 10 cm depth.

The plant list is based on 72 estimated 50 cm x 50 cm quadrats and other observations.

Ab.	(51—100%) *Endymion non-scriptus*, *Rubus fruticosus* agg., *Ulmus procera.*
Co.	(26—50%) *Sambucus nigra*, *Urtica dioica.*
Fr.	(11—25%) *Acer campestre*, *Galium aparine*, *Quercus robur*, *Silene dioica.*
Oc.	(2—10%) *Brachythecium sylvaticum*, *Bromus ramosus*, *Crataegus monogyna*, *Geum urbanum*, *Holcus lanatus*, *Ligustrum vulgare*, *Milium effusum*, *Poa trivialis*, *Prunus spinosa*, *Ranunculus ficaria*, *Rosa arvensis*, *Stellaria holostea.*
Ra.	(0—1%) *Arctium minus* agg., *Arum maculatum*, *Festuca gigantea*, *Poa nemoralis*, *Tamus communis.*
VR.	*Hedera helix*, *Moehringia trinervia*, *Pyrus communis*, *Ranunculus auricomus.*

FUNGI

MYXOMYCETES

Didymium squamulosum.

ASCOMYCOTINA

Ceratocystis ulmi, *Helvella crispa*, *Mitrophora semilibera*, *Nectria cinnabarina*, *Xylosphaera hypoxylon.*

BASIDOMYCOTINA

Agaricus augustus, *Auricularia auricula*, *Boletus subtomentosus*, *Clitocybe cerussata*, *Coprinus disseminatus*, *C. domesticus*, *C. micaceus*, *C. radians*, *Cortinarius cinnamomeus*, *Daedalea quercina*, *Flammulina velutipes*, *Gloeocystidium praetermissum*, *Grifola sulphurea*, *Gymnopilus penetrans*, *Hypholoma fasciculare*, *Lactarius cyathula*, *Laetiporus sulphureus*, *Mycena flavo-alba*, *M. galericulata*, *M. inclinata*, *M. polygramma*, *Oudemansiella radicata*, *Panaeolus sphinctrinus*, *P. subbalteatus*, *Pleurotus cornucopiae*, *P. ostreatus*, *P. ulmarius*, *Polyporus squamosus*, *Psathyrella candolleana*, *P. conopilea*, *P. spadicea*, *P. spadiceogrisea*, *Russula emetica*, *R. virescens*, *Stropharia aeruginosa*, *Tricholoma gambosum*, *Tubaria furfuracea.*

MOSSES

Atrichum undulatum, *Dicranella heteromalla*, *Hypnum cupressiforme*, *Mnium affine*, *M. hornum.*

Old Rubbish Dump

The old rubbish dump covers about 0·8 hectares (2 acres). It consists of household refuse deposited at some time after the middle of the 19th century, judging by excavated articles; the deposit shows distinct stratification, varies from two-and-a-half to about 15 feet thick, and overlies the natural soil (P. L. E. Farhall, pers. comm.). Nine measurements of surface pH in 1973/74 gave a range of 6·0–7·4, with a mean of 6·4.

The area is dominated by a dense stand of mature elder *Sambucus nigra* forming a closed canopy. The greatest species diversity is found along the path through the area and on the northern boundary edge.

The dump was the site of a large rabbit *Oryctolagus cuniculus* warren until an outbreak of myxomatosis in 1970 (Roberts & Edwards 1973). Many *Ulmus procera* here have recently died from Dutch elm disease.

The plant list is based on 48 estimated 50 cm x 50 cm quadrats and other observations.

Ab. (51—100%) *Sambucus nigra, Ulmus procera, Urtica dioica.*

Co. (26—50%) —

Fr. (11—25%) *Crataegus monogyna, Glechoma hederacea, Rubus fruticosus* agg., *Silene dioica, Stachys sylvatica.*

Oc. (2—10%) *Anthriscus sylvestris, Arctium minus* agg., *Artemisia vulgaris, Arum maculatum, Cirsium arvense, Galium aparine, Heracleum sphondylium, Poa annua, Polygonum cuspidatum.*

Ra. (0—1%) *Calystegia sepium, C. sylvatica* (Intro.), *Cardamine hirsuta, Circaea lutetiana, Conyza canadensis, Epilobium hirsutum, E. roseum, E. tetragonum, Geum urbanum, Hedera helix, Lycopus europaeus, Plantago major, Poa trivialis, Pulicaria dysenterica, Quercus robur, Rumex sanguineus.*

VR. *Alliaria petiolata, Atropa bella-donna* (Intro.), *Bryonia dioica, Endymion non-scriptus, Epilobium adenocaulon, Filipendula ulmaria, Populus nigra* (Intro.), *Prunella vulgaris, Ranunculus acris, Solanum dulcamara, Viola riviniana* (Intro.).

FUNGI

MYXOMYCETES

Reticularia lycoperdon.

ASCOMYCOTINA

Ceratocystis ulmi, Mitrophora semilibera, Nectria cinnabarina, Peziza micropus, P. repanda, Xylosphaera hypoxylon.

BASIDOMYCOTINA

Agaricus arvensis, A. edulis, Armillaria tabescens, Auricularia auricula, Coprinus atramentarius, C. comatus, C. disseminatus, C. micaceus, Dacrymyces deliquescens, Entoloma clypeatum, E. prunuloides, E. sinuatum, Flammulina velutipes, Galerina hypnorum, Hypholoma fasciculare, Lycoperdon giganteum, L. pyriforme, Mycena polygramma, M. tenerrima, Phallus impudicus, Pleurotus dryinus, P. ostreatus, Polyporus squamosus, Scleroderma aurantium.

LIVERWORTS

Lophocolea cuspidata.

MOSSES

Atrichum undulatum, Brachythecium rutabulum, Dicranella heteromalla, Eurhynchium confertum, E. praelongum, E. striatum, E. swartzii, Fissidens bryoides, F. taxifolius, Funaria hygrometrica, Mnium longirostrum, M. undulatum, Plagiothecium denticulatum, Tortula muralis.

Ponds and Streams

There are five ponds in the reserve. Two in the wood appear to be recorded as early as 1911. One of these frequently dries out completely and contains no flowering plants. The other has many rotting dead leaves in it and supports only *Apium nodiflorum*, *Callitriche* cf. *stagnalis*, and *C.* cf. *hamulata*. The pond in the Pondfield rapidly became choked with *Glyceria maxima*, *Iris pseudacorus*, and *Phragmites australis*. A pond dug in the eastern pasture in 1968 contains only *Nasturtium officinale*, while another dug in the western pasture in 1972 contains only *Alisma plantago-aquatica* at present.

Apium nodiflorum, *Nasturtium microphyllum* x *officinale* and *Nasturtium officinale* are found in the streams in the reserve.

Other Species

The following species have also been recorded in the reserve. They are predominantly casuals or confined to recently disturbed areas, such as a new clearing or the site of a new pond, but this section also includes species found only in miscellaneous habitats such as the hut enclosure and the old track west of the Pondfield.

Aethusa cynapium, *Agrostis castellana* (Intro. ?), *Anagallis arvensis*, *Atriplex hastata*, *A. patula*, *Brassica rapa*, *Capsella bursa-pastoris*, *Cardaria draba*, *Centaurium erythraea*, *Chenopodium album*, *C. bonus-henricus*, *C. polyspermum*, *C. rubrum*, *Chrysanthemum parthenium*, *Conium maculatum*, *Coronopus squamosus*, *Datura stramonium*, *Digitalis purpurea* (Intro.), *Euphorbia helioscopia*, *E. peplus*, *Hordeum murinum*, *Hypericum perforatum*, *Lactuca serriola*, *Lamium album*, *L. purpureum*, *Lapsana communis*, *Lupinus polyphyllus*, *Malva sylvestris*, *Matricaria matricarioides*, *Melilotus altissima*, *Mercurialis annua*, *Myosotis arvensis*, *Oenothera biennis*, *Papaver dubium*, *P. rhoeas*, *Pastinaca sativa*, *Pinus sylvestris* (Intro.), *Polygonum convolvulus*, *Potentilla sterilis*, *Ranunculus flammula*, *Senecio viscosus*, *S. squalidus*, *Sinapis alba*, *Solanum nigrum*, *Sonchus asper*, *S. oleraceus*, *Thlaspi arvense*, *Tragopogon pratensis*, *Tripleurospermum maritimum*, *Verbascum phlomoides*, *Veronica agrestis*.

FUNGI (locations not specified).

BASIDOMYCOTINA

Collybia butyracea, *Coprinus xanthothrix*, *Lycoperdon perlatum*, *Oudemansiella mucida*, *Psathyrella squamosa*, *Russula cyanoxantha*.

LICHENS (on paving stones and concrete fence posts)

Candelariella aurella, *Lecanora dispersa*, *L. muralis*, *Xanthoria parietina*.

Extinctions

The following species were recorded earlier this century in the reserve but have not been recorded in the current survey. They may therefore be extinct. Those marked with an asterisk (*) were present at least up to 1968.

Anthriscus caucalis, *Betonica officinalis*, *Bidens tripartita**, *Carex sylvatica*, *Ceratophyllum demersum**, *Cirsium palustre**, *Clematis vitalba*, *Euphorbia amygdaloides**, *Fragaria vesca*, *Galium palustre*, *G. saxatile*, *Geranium molle*, *G. robertianum*, *Lemna trisulca**, *Lotus tenuis*, *Luzula pilosa**, *Mentha aquatica*, *Myosoton aquaticum*, *Myriophyllum spicatum*, *Plantago media*, *Polygonum lapathifolium*, *Potamogeton crispus**, *Potentilla sterilis**, *Ranunculus flammula**, *R. sceleratus**, *Rorippa islandica**, *Rumex conglomeratus*, *Scirpus setaceus**, *Senecio aquaticus*, *Silene alba*, *Solanum nigrum**, *Solidago canadensis*, *Vicia cracca*, *Viola reichenbachiana*.

Discussion

It is worth noting than an index of diversity based on flowering plants would be quite different to one based on fungi. Moreover, one of the poorest habitats for flowering plants, the woodland, has the richest fungus flora and the highest total flora of all the habitats. It is possible that management to encourage other species of flowering plants might in fact reduce the total floristic diversity of the habitat.

The fungus lists are still clearly far from complete and this may also apply to the bryophytes. The latter would be amenable to a survey in terms of frequency, and some form of crude frequency estimates for the fungi might in future be possible using the mapped distribution of fruiting caps over several years, though this would at most indicate only the minimum distribution of species.

Changes in the flora have occurred since botanists first recorded in the wood. In an isolated habitat such as the woodland a gradual loss of species is probably to be expected: Hooper (1971b) calculated that the critical distance between some woodlands for the maintenance of diversity in the ground flora might be less than 0·8 km, and on this basis Perivale Wood is not in a good position.

Primula vulgaris and *Anemone nemorosa* were apparently common at one time in the wood but were almost exterminated by the activities of flower-hawkers around the turn of the century (Webb 1911). It is not clear to what extent these species recovered subsequently, but they are certainly not frequent at present. The many plants of waste-places and damp meadow reported in the wood by Shenstone (1913) also seem to have disappeared. He suspected they were brought in on muddy feet, but there is still considerable traffic through the reserve today with school parties, etc. The loss or extreme rarity of *Betonica officinalis*, *Euphorbia amygdaloides*, *Lotus tenuis*, *Luzula pilosa*, and *Potentilla sterilis* suggests that during this century the tree canopy may have changed from open to closed and the coppice cycle has lapsed. There was probably a regular coppice cycle in the wood at the beginning of the century, judging from Webb (1911) and an Agreement of 1914, but later this appears to have become sporadic and unplanned if carried out at all. The closed canopy has probably reduced any effects on the ground flora where coppicing has been carried out recently.

The reserve is distinctly non-calcareous and the soils tend to be wet and acidic, with the exception of the old rubbish dump. The oak-wood is particularly acidic. Generally the number of flowering plant species, e.g. in the pasture, would not therefore be as high as in areas with different conditions (see Rorison 1971). There are some interesting absences from the oak-wood flora: *Carpinus betulus*, frequent in an oak-wood on nearby Horsenden Hill and in woods to the north-west at Ruislip; *Pteridium aquilinum*, absent despite the acid soil, perhaps due to the damp conditions and closed canopy; the soil may be too acid for *Mercurialis perennis*; a grass which might have been expected in the pasture is *Poa pratensis*.

The current survey of the flora should be of considerable use for assessing changes in the future. The Pondfield will undoubtedly change considerably over the years if left undisturbed. The next stage in the succession on the old rubbish dump is difficult to predict, particularly now the rabbits *Oryctolagus cuniculus* have gone and the *Ulmus procera* is rapidly dying from Dutch elm disease. This disease may also radically alter the wet elm woodland and elm woodland edge over the next few years. It is also possible that the coppice cycle may be restarted in the future, with some thinning of the tree canopy, and some of the pasture may possibly change to hay meadow.

There is scope for subdividing some of the habitats on the basis of vegetation. The Pondfield and pastures immediately suggest themselves, but this would require further detailed work.

We would like to thank the many people who have assisted us in the preparation of this paper, particularly R. W. G. Dennis, J. P. Houlton, D. N. Pegler and D. A. Reid for their identification of the fungi, and J. P. Houlton and R. Greef for their field records; C. C. Townsend for his determinations of the bryophytes and A. Hall for his field records; J. R. Laundon for his determinations of the lichens; C. E. Hubbard for his records of the hybrid grasses and others; Mrs J. Byatt for checking the *Crataegus* specimens; and B. O. C. Roberts for typing part of the manuscript.

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The Birds of Perivale Wood Nature Reserve: a Summary of Research 1965-1971

by K. A. Roberts and P. J. Edwards

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Summary

This paper presents the results of recent research on the birds of Perivale Wood Nature Reserve in west London. The aim is to determine the status and habitat requirements of each species in the reserve as a preliminary to work on the population dynamics and ecological and behavioural adaptations by which the various species utilize the area. Data on the frequency of observations, the size of the breeding population, nesting success and communal roosting are presented. Data are also included on vertical distribution in close-canopy oak woodland and occurrence of species in various woodland habitats, elder thicket and old pasture at different times of the year. Methodological difficulties and future research are also discussed.

Introduction

This paper reviews some of the research on the birdlife of Perivale Wood Nature Reserve which has been carried out between 1965 and 1971. Two earlier accounts of the birds of the reserve have been published (Webb 1911, Bartlett 1962).

Recent work has been oriented towards determining the status and habitat requirements of each species in the reserve as a preliminary to work on the population dynamics and ecological and behavioural adaptations by which the various species utilize the resources of the area.

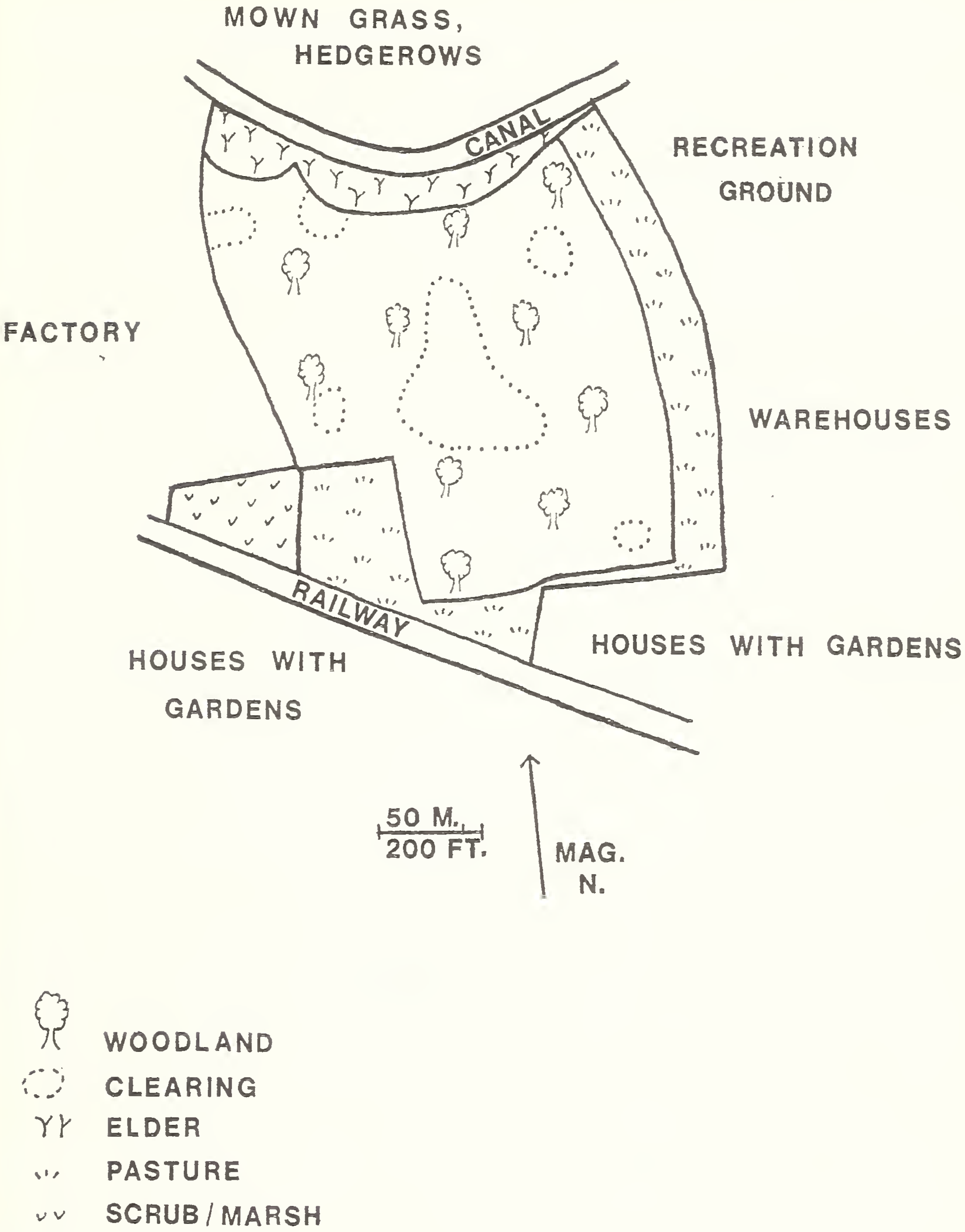

FIG. 1. Habitats in and around the reserve.

The reserve is situated in west London in the Brent valley. It lies on London Clay about 24.5 metres (80 feet) above sea level. To the north the reserve is bordered by a canal and the mown grass fields and hedges of Horsenden Hill. The rest of the reserve is surrounded by houses, a factory, warehouses and a railway embankment (Fig. 1).

Perivale Wood Nature Reserve covers a total of 10.9 hectares (27 acres). Some 6.9 hectares (17 acres) are mature closed-canopy oak *Quercus robur* woodland with occasional clearings. The underlay is primarily hazel *Corylus avellana*, hawthorn *Crataegus monogyna*, bramble *Rubus fruticosus* agg. and bluebell *Endymion non-scriptus.* Along the northern edge there is a dense thicket of mature elder *Sambucus nigra* covering some 0.8 hectares (2.0 acres). To the south and east of the wood there are 2.2 hectares (5.4 acres) of old species-rich pasture grazed by horses in the summer, and in the south-west corner there is an ungrazed marshy area of about 0.6 hectares (1.5 acres) currently dominated by reed sweet-grass *Glyceria maxima*, great hairy willowherb *Epilobium hirsutum*, thistles *Cirsium arvense* and various grasses. A detailed botanical description can be found in Roberts & Edwards (1974).

Casual Records, 1965 to 1970

Although records have been kept of birds in the reserve for 70 years or more there was little systematic or quantitative work prior to 1968. Most records before this time, and many since, are in the form of casual observations recorded by visitors in the reserve's log books. These casual records are probably best described as a sample of a sample of the real bird population, for not all the birds present are likely to be seen by an observer and not all those seen are likely to be considered worth reporting. Which birds are seen will be affected by the sorts of factors described by Emlen (1971). Which of the birds seen will actually be reported probably depends on a very different complex of factors, some of which may be general to most observers, while some may be specific to particular individuals. Little work seems to have been done on this latter type of selection. The deduction of the status of a species from such records is also probably liable to several sources of bias.

Table 1 shows the number of days per month from 1965 to 1970 on which observers recorded a casual observation at the reserve. The reduction during the second half of the period is probably partly due to a change to more systematic recording by several observers. With a similar breakdown of records for each species it might be possible by comparing actual with potential observations to obtain estimates of status in some detail, though the process would be rather time-consuming. Observations were recorded at the reserve on 20 per cent of the possible days, so an extremely crude approximation would be that each species is at least five times more frequent than the casual records suggest.

TABLE 1. The number of days per month on which casual observations were reported.

	Month												
Year	J	F	M	A	M	J	J	A	S	O	N	D	Total
1965	9	8	9	13	9	8	8	14	5	3	5	12	103
1966	10	8	25	11	8	7	9	10	5	6	5	5	109
1967	5	10	8	14	8	10	10	6	10	10	3	8	102
1968	6	7	8	17	3	5	3	0	2	3	1	0	55
1969	1	1	1	5	3	2	6	7	5	4	3	1	39
1970	3	1	2	5	4	1	2	4	1	1	1	0	25
Total	34	35	53	65	35	33	38	41	28	27	18	26	433

TABLE 2. Casual records of birds in the reserve between 1965 and 1970, not including the commoner breeding species or records from systematic censuses.

Days	1 year	2 years	3 years	4 years	5 years	6 years
1-10	Yellowhammer Common sandpiper Stock dove Feral pigeon Nuthatch Whinchat Firecrest Tree pipit Waxwing Hawfinch Siskin Corn bunting	Jack snipe Black-headed gull Jackdaw Redstart Reed warbler Yellow wagtail Redpoll Brambling	Pheasant Partridge Little owl Willow tit Wheatear Reed bunting	Sparrowhawk Woodcock Turtle dove Sedge warbler Lesser whitethroat Grey wagtail	Cuckoo	Garden warbler
11-20			Lesser spotted woodpecker	Long-tailed tit Collared dove	Tree sparrow Green woodpecker Swift Fieldfare	
21-30				House sparrow Willow warbler Swallow Whitethroat	Linnet	Tawny owl Snipe
31-40				Mistle thrush	Marsh tit	Coal tit Spotted flycatcher Blackcap Chiffchaff Treecreeper
41-50						
51-60						
61-70					Redwing	Carrion crow Gt. spotted wdpkr. Goldcrest
71-80						Goldfinch
81-90					Pied wagtail	Kestrel Woodpigeon Chaffinch
91-100					Mallard	
101-110						Greenfinch Bullfinch
111-120						Magpie
121-130						Moorhen
131-140						Jay

Table 2 lists all species for which casual records exist except for species seen from, above or very near to the reserve but not in it, such as several species of gull; and also the Table does not include the commoner breeding birds, great tit, blue tit, wren, robin, dunnock, song thrush, blackbird and starling. The number of years in which a species is reported can be considered a rough index of regularity while the number of days is a rough index of frequency. Brief estimates of the status of each species can be found in Roberts & Edwards (1973).

Evidence gathered in other studies (see later) suggests that these casual records can be misleading in at least some instances. Reed bunting is probably more frequent than the data would suggest, and lesser whitethroat and lesser spotted woodpecker are regular breeding species. Pied wagtail almost certainly occurs on far more days than mallard, yet the latter is recorded more often. Carrion crow, jay and magpie are all resident, with crow being most numerous overall and most easily seen, yet being the least recorded. The position of cuckoo and garden warbler is somewhat anomalous.

The Breeding Population, 1968-1971

A census of breeding birds using the mapping technique described by Williamson (1964) has been carried out each year since 1968. The technique is not a perfect indicator of actual breeding density, and the actual numbers of each species breeding in the reserve undoubtedly vary from year to year. Bearing this in mind some conclusions can nevertheless be drawn regarding the size of the breeding population. The census results are given in Table 3.

There tend to be one or two pairs of mallard, moorhen, great spotted woodpecker, coal tit, marsh tit, willow tit, treecreeper, whitethroat, lesser whitethroat, bullfinch, chaffinch and tree sparrow. Kestrel, tawny owl, lesser spotted woodpecker, long-tailed tit, mistle thrush, spotted flycatcher and magpie also breed in or very close to the reserve, often being seen in the reserve. There tend to be from three to seven pairs of blackcap, willow warbler, chiffchaff, greenfinch, jay and carrion crow.

Estimates of the more numerous breeding species seem a little less reliable. These are dunnock, robin, great tit, blue tit, starling, woodpigeon, song thrush and blackbird. In 1969 for example a special census of blackbirds showed 65 territories in the woodland, whereas the all-species census indicated 38 to 40 in the same area. The other commoner breeding species may be similarly underestimated.

Even with the census results obtained it appears that the overall density of breeding birds in the reserve is just about the highest ever recorded in any woodland in Britain (see Batten 1972), with around 2,000 pairs per square kilometre. This estimate is based on the density for the whole reserve area of 10.9 hectares (27 acres), although 2.2 hectares (5.4 acres) of these are grazed grassland in which no birds breed.

TABLE 3. Number of 'territories' at Perivale Wood Nature Reserve.

	1968	1969	1970*	1971
Mallard	1?	1	1	1
Moorhen	1	2	2	2
Great spotted woodpecker	1	1?	1	1
Lesser spotted woodpecker	1?	1?	1	1
Carrion crow	1+	2	2	6
Magpie	1+	1?	1?	2
Jay	1	2	2	3
Great tit	11	12	8	18
Blue tit	36	27	27	69
Coal tit	1?	0	1	1
Marsh tit	0?	1?	1	—
Willow tit	0?	1?	0?	1
Treecreeper	1	1	2	2
Wren	31	28	14	21
Song thrush	22	16	13	20
Blackbird	54	44	24	44
Robin	19½	17½	14½	31
Blackcap	2	4	4	7
Whitethroat	1	0	1?	2
Lesser whitethroat	1?	1	1?	1
Willow warbler	7	3	1	—
Chiffchaff	4	3	4	4
Spotted flycatcher	1	1?	0	1
Dunnock	12½	14	17	25
Starling	—	15	5	22
Greenfinch	5½	4½	3½	7
Bullfinch	1	2	1?	1
Chaffinch	1	2	1?	3
Tree sparrow	0?	0?	1	—

*Less time was spent in the field in 1970 than in other years.

Nesting

Very little information on nesting is available for the reserve, except perhaps for blue tit and great tit (Dodd 1971). Our data suggest that young fly from some 23 per cent of blackbird nests (N=26), from some 25 per cent of song thrush nests (N=12), and from some 36 per cent of woodpigeon nests (N=11). Equivalent figures for blue tit are 79 per cent (N=29) and for great tit 82 per cent (N=11). Snow (1958) quotes equivalent figures for blackbirds of 50 per cent in a botanic garden and 14 per cent in Wytham Wood. Krebs (1971) quotes 92 per cent for blue tit and great tit combined in woodland.

N=number of observations.

Vertical Distribution in the Oak-wood

The data on vertical distribution were collected between March and September inclusive, by means of sixteen transect bird censuses in which all birds were recorded in the vegetation layer in which they were first observed, irrespective of activity. These layers were (see Roberts & Edwards 1973):

1. The ground and herb layer.
2. The field layer.
3. The shrub canopy.
4. The dead branch zone above the shrub layer.
5. The tree canopy.
6. The air above.

The data are given in Table 4. Blue tit, great tit and house sparrow were generally found in all the layers except for an absence of blue tit from the ground layer, and whereas all three species showed peaks in the shrub canopy, blue tit also showed a peak in the tree canopy. Blackbird and song thrush both occurred in all layers, but both showed a marked predominance in the ground layer. Dunnock and wren were found only in the shrub canopy and below; robin showed a similar distribution but was occasionally found above the shrub canopy. Starling occurred only in the shrub canopy and above. Carrion crow, jay and woodpigeon were found to be primarily birds of the upper layers, though there were also a few records from the ground.

Table 4. Total number of birds recorded in each vertical layer of vegetation on sixteen transect censuses between March and September 1967.

Layer	1	2	3	4	5	6	Total
Woodpigeon	80	2	7	54	202	382	727
Carrion crow	2	0	1	1	22	94	120
Jay	3	0	3	10	7	1	24
Great tit	4	9	16	11	10	0	50
Blue tit	0	7	46	28	52	0	133
Wren	11	9	18	1	0	0	39
Song thrush	21	5	6	1	6	0	39
Blackbird	157	45	28	19	10	2	261
Robin	26	19	27	2	4	0	78
Dunnock	17	10	10	0	0	0	37
Starling	0	0	62	34	93	349	538
House sparrow	26	15	90	39	27	1	198

Detailed observations of house sparrows in the wood in May showed that the majority were collecting beakfuls of caterpillars and then flying out of the wood to neighbouring houses; most birds were collecting caterpillars in the tree canopy and field layer but were flying into and out of the wood through the dead branch zone or the upper part of the shrub canopy, where the flyway was presumably less obstructed (Table 5).

Table 5. Activities of house sparrows in different layers, May 1967.

	Layer	Collecting caterpillars	Flying
6.	Air above	0	0
5.	Tree canopy	12	0
4.	Dead branch zone	4	9
3.	Shrub canopy	3	5
2.	Field layer	9	0
1.	Ground	1	0

Records also suggest that most of the records of blackbirds in the region of the dead branch zone are associated with territorial activity such as singing or fighting, though this needs confirmation.

Chalke (1954) found in an oak-wood at Bookham, Surrey, that robins tended to be birds of the lower levels except when singing males went higher in spring, and this seems to be identical to the pattern at Perivale where practically all the records above the shrub canopy are of singing birds. Though a direct comparison with Beven's (1959) results is not possible due to the different methods employed, his data on the blackbird, great tit and wren seem to show roughly the same sort of distribution as ours, though at Bookham blue tit seems to favour tree canopy more and shrub canopy less than at Perivale. Edington & Edington (1972) in a mixed broad-leaved woodland in South Wales found that starlings fed exclusively on the ground, usually in clearings or the woodland edge. It is not clear whether starlings breeding in Perivale Wood get all their food from the upper vegetation levels or, more probably, leave the wood to feed in the surrounding pasture or gardens.

Breeding Density in Different Habitats

The reserve was divided up into five major habitat types, excluding the pastures. These were clearings (10% of the area), close canopy woodland (53%), woodland edge (23%, a strip some 30 metres wide), elder thicket (7%) and scrub/marsh (7%). Various types of registrations from the breeding birds censuses were then examined to see how they correlated with these habitat divisions. Overall breeding densities at Perivale were also compared with equivalent data for an area of 9.7 hectares of scub and woodland with suburban surroundings at Brent (Batten 1972) and an area of 16.2 hectares of dense interior oak-wood in a more rural setting at Bookham (Beven 1972).

Table 6 gives the ratios of song contacts for selected species in each habitat. Chiffchaff, willow warbler and blackcap are commonest in the clearings, though blackcap is also frequent in the elders. Chaffinch and greenfinch are commonest in the woodland edge. Records of pairs of bullfinches (N=11) show an identical pattern. Blue tit, great tit and robin are generally distributed through the various woodland habitats but less frequent in the elders and scrub/marsh. Dunnock is less common in the clearings and dense woodland and commonest in the woodland edge. Wrens seem to favour clearings and woodland edge, and blackbirds the latter. Song thrush is commonest in the elders but also numerous in the woodland edge.

Table 6. Song contacts per unit of area, April - June 1968 - 69. Ratios (woodland = 1). N = number of observations.

	Clearing	Woodland	Edge	Elder	Other	
Great tit	1·5	1·0	1·2	0·4	0·4	N = 71
Blue tit	1·1	1·0	1·2	0·7	0·1	N = 183
Robin	1·2	1·0	0·8	0·3	0·3	N = 146
Wren	1·5	1·0	1·9	1·1	0·5	N = 233
Dunnock	1·8	1·0	3·8	2·8	2·6	N = 102
Blackbird	1·0	1·0	1·9	0·7	0·3	N = 379
Song thrush	1·2	1·0	2·8	4·3	0·7	N = 150
Chiffchaff	7·5	1·0	1·5	1·0	0	N = 47
Willow warbler	3·2	1·0	0·3	0	0	N = 51
Blackcap	2·4	1·0	1·5	2·4	0	N = 32
Chaffinch	2·7	1·0	6·7	2·3	0	N = 18
Greenfinch	0	1·0	5·2	2·6	1·4	N = 22

Table 7 shows the number of observations of woodpeckers in each habitat during the breeding season. Taking into account the available area of each habitat type, great and lesser spotted woodpeckers seem to frequent close canopy woodland and clearings about equally. Of thirteen observations of treecreepers during the same period all but one were in the close canopy woodland.

Table 7. Percentage of observations in each habitat, April to June. N = number of observations.

	Clearing	Woodland	Edge	Elder	Other	
Great spotted woodpecker	13	81	6	0	0	N = 16
Lesser spotted woodpecker	17	83	0	0	0	N = 12
Green woodpecker	—	—	—	—	—	N = 0
Treecreeper	8	92	0	0	0	N = 13

In general the distribution of woodpeckers, finches and warblers is as might be expected from their recorded habitat preferences (e.g. Witherby et al. 1943; Newton 1967). That dunnock is a bird of woodland edge and shrubs rather than woodland is borne out by the data and also by comparing breeding densities in Table 8. Robin is interesting in that it appears to breed at a relatively low density at

Perivale (see Table 3), compared to high densities in scrub and woodland at Brent and dense oak-wood at Bookham. It is not obvious why this should be so. The higher blue tit density at Perivale might perhaps be related to nest-site availability, though, if so, it is not immediately clear why great tit does not show a similar pattern. Marsh tit, willow tit and coal tit also seem less common at Perivale than they might be. Blackbird and song thrush densities at Perivale and Brent are higher than at Bookham, perhaps because these species are able to utilize other habitats such as neighbouring fields and gardens in the suburban areas for feeding in winter. The high density of wrens at Perivale is also noteworthy.

TABLE 8. Number of territories per square kilometre in three oak-woods compared.

	Perivale Isolated oak-wood in the suburbs, 1968-69	Brent Isolated elm and oak-wood and scrub in the suburbs, 1968-1970 (Batten 1972)	Bookham Dense interior of oak-wood 1968-70 (from Beven 1970)
Mallard	9·1	10·3	—
Moorhen	13·7	—	—
Kestrel	—	10·3	—
Great spotted woodpecker	9·1	—	—
Lesser spotted woodpecker	9·1	—	—
Carrion crow	18·3	20·6	—
Magpie	9·1	10·3	—
Jay	13·7	10·3	—
Great tit	105·1	123·5	94·6
Blue tit	287·9	164·6	162·5
Marsh tit	4·6	—	18·5
Willow tit	4·6	20·5	—
Coal tit	—	10·3	37·0
Long-tailed tit	—	—	8·2
Treecreeper	9·1	—	22·6
Nuthatch	—	—	26·7
Wren	269·6	144·1	154·3
Mistle thrush	—	—	10·2
Song thrush	173·7	174·9	43·2
Blackbird	447·9	380·7	67·9
Robin	169·1	277·8	253·0
Blackcap	27·4	41·2	20·3
Garden warbler	—	10·3	6·2
Whitethroat	4·6	30·8	—
Lesser whitethroat	9·1	20·6	—
Willow warbler	45·7	72·0	20·5
Chiffchaff	32·0	10·3	20·5
Spotted flycatcher	9·1	—	—
Dunnock	118·1	236·7	30·9
Starling	137·1	—	55·5
Greenfinch	45·7	102·9	—
Bullfinch	13·7	51·5	—
Chaffinch	13·7	20·6	22·6
Goldfinch	—	20·6	—
Yellowhammer	—	10·3	—
Reed bunting	—	10·3	—

The breeding density of blackbirds in 1969 seems to be one of the highest recorded anywhere. Woodland breeding densities typically tend to be less than 0.1 'territories' per hectare (Williamson 1964, 1968, Williamson & Homes 1964; Beven 1953, 1963; Hillman 1958; Snow 1958 and Simms 1971 quote a number of other examples). Hillman (1963) recorded a density of 1.3 singing males per hectare in a suburban oak-wood in Kent, and Batten (1972) found a density of 3.8 territories per hectare in an acre of woodland and scrub in the London suburb of Brent. This compares with a density of 7.4 territories per hectare in Perivale Wood in 1969, and in fact in the southern half of the wood the density was in excess of 11 territories per hectare. Snow (1958) considered gardens to be the optimum habitat for blackbirds, and recorded densities of up to 7.3 territories per hectare at Oxford. In an area of houses and gardens within a mile of Perivale Wood counts of singing birds indicated a density of 3.7 territories per hectare in 1969, and Simms (1965) gives a map showing some 4.5 territories per hectare in a similar habitat in Dollis Hill. Batten (1972) found 2.9 territories per hectare in an area of suburban gardens at Brent.

Snow (1958) and others have suggested that a restricted food supply in winter may be the cause of low breeding densities in woodland. The blackbirds of Perivale Wood leave the wood for part of the day in winter to feed in other habitats (Roberts in prep.) and this in conjunction with the high cover density in Perivale Wood may account for the very high breeding density there.

The censuses which recorded the high 1969 blackbird density in Perivale Wood indicate a population holding breeding territories rather than, for example, a feeding aggregation. Out of 334 records of blackbirds over ten visits, 247 were of males, and 169 involved singing birds. There were 85 records of neighbours singing simultaneously and 14 records of aggressive encounters. At least 24 of the 65 recognised territories had female birds associated with them, and what nests were found confirmed the territories deduced from the censuses. Several areas in the wood were also used for feeding by blackbirds but were not apparently part of any defended territories.

Distribution in Habitats in Winter

Data from nineteen transect censuses carried out at midday between 12 January and 10 February 1971 through the dense woodland, woodland edge and elder thicket habitats (Table 9) indicate that the highest densities of woodpigeon, carrion crow, blue tit and great tit were to be found in dense woodland, with blue tit also numerous in the elders. Robin, wren and house sparrow were at their highest density in the elders, and song thrush, blackbird, starling and dunnock in the woodland edge.

Table 9. Sightings per unit length of transect census, ratios (woodland = 1·0), from 19 censuses between 12 January and 10 February 1971. N = number of observations.

	Woodland	Woodland edge	Elder thicket	
Woodpigeon	1·0	0·7	0·2	N = 174
Carrion crow	1·0	0·2	0·2	N = 198
Starling	1·0	1·5	0·1	N = 118
Blackbird	1·0	1·6	0·8	N = 475
Song thrush	1·0	12·7	7·3	N = 14
Redwing	1·0	7·0	7·3	N = 10
Dunnock	1·0	13·0	0	N = 30
Robin	1·0	0·5	1·4	N = 39
Wren	1·0	2·2	16·0	N = 20
Blue tit	1·0	0·6	0·9	N = 164
Great tit	1·0	0·7	0·4	N = 134
House sparrow	1·0	8·1	23·9	N = 99

Some data are also available on woodpeckers in winter, in terms of the distance travelled through each habitat while under observation (Table 10). The distribution for great and lesser spotted woodpeckers is very similar to that shown in Table 7, and the marked difference between these two species and the green woodpecker is to be expected. In fact most of the pasture records of the latter species were in an area where several ant-hills of the yellow meadow ant *Lasius flavus* occur.

Table 10. Distance travelled through each habitat while under observation (%). January and February.

	Clearing	Wood	Edge	Elder	Pasture	Other
Great spotted woodpecker (N = 960 metres)	20·8	68·7	10·4	0	0	0
Lesser spotted woodpecker (N = 1,000 metres)	22·5	62·5	15·0	0	0	0
Green woodpecker (N = 705 meters)	6·4	19·2	49·6	0	24·8	0

The Birds of Old Pasture

Table 11 illustrates the months during which various species of birds have been observed feeding or apparently searching for food in the old, florally-rich pastures between 1965 and 1971. The table is based on casual records.

The species present in most months are woodpigeon, carrion crow, blackbird, pied wagtail and starling. Kestrels are also recorded over the pastures in most months. Moorhen are regular except for a few months during the breeding season. Mallard on the other hand only occur in the pastures during their breeding season. Fringillids are rare in winter and most frequent in July and August when various grasses and flowers are in seed. Fieldfare, redwing, mistle thrush, meadow pipit and grey wagtail are winter visitors. Spotted flycatchers regularly take insects in the pastures between June and September. Green woodpeckers are attracted to the ant-hills in pastures.

One interesting feature is the lack of gulls feeding in this habitat. Black-headed gulls, and more rarely common gulls, will occasionally fly low over the pastures and have sometimes been attracted down by scraps of bread, but otherwise never feed here.

TABLE 11. Monthly occurrence of species feeding in old pasture.

	J	F	M	A	M	J	J	A	S	O	N	D
Mallard	–	x	x	x	–	–	–	–	–	–	–	–
Kestrel	x	x	x	x	x	x	x	x	x	x	x	x
Partridge	–	–	x	x	x	–	–	–	–	–	–	–
Moorhen	x	x	x	x	x	–	–	–	–	x	x	x
Tawny owl	–	–	–	–	x	–	x	–	–	–	–	–
Woodpigeon	x	x	x	–	x	–	x	x	x	–	x	x
Feral pigeon	–	–	x	–	–	–	–	–	–	–	–	–
Stock dove	–	–	–	–	–	–	x	–	–	–	–	–
Green woodpecker	x	–	x	–	x	–	–	–	–	–	–	–
Swift	–	–	–	–	x	–	x	–	–	–	–	–
Carrion crow	x	x	x	x	–	–	x	x	x	–	x	x
Jay	–	x	x	–	–	–	x	–	–	–	–	x
Magpie	–	–	–	–	–	x	x	–	–	x	x	x
Swallow	–	–	–	x	x	x	x	x	–	x	–	–
Blackbird	x	x	x	x	x	x	x	x	–	x	x	x
Song thrush	–	–	x	x	x	x	–	x	–	–	–	x
Mistle thrush	x	x	x	–	–	–	–	x	–	–	–	x
Redwing	x	x	x	–	–	–	–	–	–	–	x	–
Fieldfare	–	x	–	–	–	–	–	–	–	–	–	x
Wheatear	–	–	–	–	x	–	–	x	–	–	–	–
Robin	–	–	–	–	–	–	–	x	–	–	–	–
Spotted flycatcher	–	–	–	–	–	x	x	x	x	–	–	–
Grey wagtail	–	–	–	–	–	–	–	–	–	–	x	x
Yellow wagtail	–	–	–	–	–	–	–	x	–	–	–	–
Pied wagtail	x	x	x	x	x	–	x	x	x	x	x	x
Meadow pipit	x	x	x	–	–	–	–	x	–	–	–	–
Starling	x	–	x	x	–	x	x	–	–	x	x	x
Greenfinch	–	–	–	x	–	x	x	x	–	–	–	–
Bullfinch	–	–	–	–	–	x	x	x	–	–	–	–
Goldfinch	–	–	–	x	x	–	x	x	x	x	–	–
Chaffinch	–	x	x	x	–	–	x	x	–	–	x	x
Linnet	–	–	–	x	x	x	x	x	–	–	–	–
House sparrow	–	–	–	x	–	–	x	x	x	x	–	–

Roosting

Data on roosting are available only for those species which roost communally. Large numbers of woodpigeons roost in the oaks in winter, and most years their numbers tend to reach around 5,000 birds. Several attempts to trace their feeding grounds outside the reserve suggest that most of these birds descend singly or in pairs into various back gardens, allotments, fields, etc., up to 24 km (15 miles) away, rather than feeding anywhere as a flock.

Groups of house sparrows, generally not more than 100 or so, sometimes roost in a hazel or in the elder thicket, but rarely stay more than a few days. Up to 15 or so starlings can sometimes be found in the elder thicket. Between 150 and 400 blackbirds used to roost regularly in the elder thicket between mid-July and mid-March, from 1967 to 1969. No regular roost has been present since, though one in hawthorn on the opposite side of the canal can still be found each winter; it also contains redwing and fieldfare. A roost of up to 250 carrion crows can be found in the reserve or on the neighbouring hill. A roost of reed buntings occurred in the marsh area in 1971, 33 adults being ringed there.

The Winter Population

Data on the winter population are restricted to a series of 550-metre transect censuses through pasture, woodland, edge and clearing habitats at 10.30 hours from 11 February to 20 March 1966, and a series of 975-metre transects through woodland, edge and elder habitats at 13.00 hours from 12 January to 10 February 1971 (Table 12). Some differences between the two sets of censuses are undoubtedly due to the differences in the habitats sampled.

The censuses indicate that species such as wren, robin, dunnock and song thrush are to be found in the reserve throughout the winter, though this does not preclude the possibility that they feed elsewhere for part of the day. Both sets of censuses show an apparent decrease in the numbers of blackbirds as the breeding season approaches. The ratios of blue tits to great tits in winter and summer seem quite different; the two species are almost equally common in winter whereas there are far more blue tits in the breeding season. Some of the censuses also reflect the regular visits of fairly large flocks of redwings to the pastures during the winter and the presence of goldcrests in the woodland.

TABLE 12. Results of two sets of transect censuses, grouped in eight to ten day periods. The table gives the average count per transect, and in brackets the maximum transect count, for selected species. The two series are not directly comparable.

Year:	1971	1971	1966	1966	1966	1966
No. censuses	10	9	10	8	10	10
Period	12-26Jan.	27-10Feb.	11-20Feb.	21-28Feb.	1-10 Mar.	11-20 Mar.
Mallard	——	——	1·9(4)	0·4(2)	2·6(9)	2·3(6)
Moorhen	——	——	1·2(5)	3·3(6)	2·4(4)	3·2(5)
Carrion crow	8·5(13)	12·6(22)	4·8(6)	3·9(4)	5·4(18)	6·7(10)
Magpie	——	——	0·4(2)	1·1(2)	0·7(2)	1·1(2)
Jay	——	——	2·3(4)	2·9(4)	3·0(4)	3·1(6)
Great tit	6·9(24)	8·6(18)	12·6(19)	13·9(17)	10·3(16)	5·8(9)
Blue tit	9·0(12)	11·4(18)	10·3(15)	8·3(11)	10·3(13)	8·7(10)
Wren	1·3(5)	1·0(4)	0·5(1)	2·3(4)	2·8(5)	2·2(3)
Mistle thrush	——	——	0·6(2)	0·9(1)	1·2(2)	0·8(2)
Fieldfare	——	——	0·5(4)	0(0)	0(0)	0(0)
Song thrush	1·2(3)	0·8(2)	3·5(6)	5·8(8)	6·3(10)	4·8(7)
Redwing	0·7(4)	0·7(3)	11·0(55)	23·0(48)	22·7(62)	0·8(4)
Blackbird	29·6(37)	20·6(26)	41·3(50)	38·0(49)	34·3(42)	33·2(36)
Robin	1·3(3)	3·0(5)	3·9(8)	4·6(7)	5·1(8)	4·1(7)
Goldcrest	——	——	0·1(1)	0·4(2)	1·0(4)	0·8(4)
Dunnock	2·2(8)	0·9(4)	5·4(11)	6·6(10)	6·1(8)	4·9(6)
Greenfinch	——	——	0·5(5)	2·3(7)	6·3(15)	5·3(8)
Goldfinch	——	——	0·2(2)	1·0(8)	0·7(5)	0·2(2)
Linnet	——	——	0·6(5)	0(0)	0(0)	0(0)
Bullfinch	——	——	1·3(5)	1·0(7)	0·3(2)	0·4(2)
Chaffinch	——	——	1·3(3)	1·8(3)	2·9(7)	2·2(5)
Woodpigeon	6·8(16)	11·4(28)	——	——	——	——
Starling	6·1(21)	7·1(13)	——	——	——	——
House sparrow	9·4(32)	4·7(9)	——	——	——	——

Discussion

Several problems have arisen during the course of the work at Perivale Wood, some of them methodological. In so far as they constitute a considerable proportion of the data on the birds of the reserve and the basic data for most county bird reports, it would be useful to know the range of quantitative variation which a qualitative estimate of status bounds, and also what variation one could expect if different people were to analyse the same data. The latter should not be difficult to assess, and the former could more easily be measured in a reserve such as Perivale where there is some control over access and where there is also comparable quantitative data available.

The data on habitat preferences in the breeding season and in winter are not directly comparable because the former is based on nesting territories while the latter is probably based mainly on feeding areas. The discrepancy between feeding and nesting areas in summer is probably negligible for many species, but may effect some considerably (cf. Edington & Edington 1972).

It would be preferable to compute absolute species densities for each habitat but this would require an estimate of the observability of each species at different times of the year. At present there is also probably some bias within species due to variations in cover density between habitats. A similar problem applies to the vertical vegetation layer data, and correction factors for different cover density in different layers and for cover density between the observer and each layer may be desirable.

The efficiency of mapping censuses for deriving absolute population densities has been considered earlier, and transect censuses in winter may well be even less satisfactory unless very stringent procedures are used (cf. Emlen 1971). Outside the breeding season too the numbers of a species in the reserve may vary systematically or otherwise during the day.

Despite methodological drawbacks, the available data on the birds of the reserve present an interesting picture but pose more questions than they answer. The breeding densities of several species are not typical of a woodland habitat, and while there are theories that would account for this, there are as yet no field data to support them.

Further data on nesting and mortality are urgently required. Breeding success in the wood may or may not be adequate to maintain the population and this would be very relevant to any investigations of breeding density. It would also be interesting to know the average and overall success rates of blackbirds in the wood considering the densities they achieve, and particularly if the density shows variations from year to year.

The data on vertical distribution suggest that not only are there species differences in frequency in each layer but also that different layers may be used for different behavioural activities. A detailed activity-type profile for each species in each layer could be of considerable interest. Our data also show some closely related species which do not appear to be differentiated by vertical distribution. Such species as the tits may be utilizing different feeding niches within the same layers (e.g. Lack 1971) while song thrush and blackbird are to some extent separated horizontally if not vertically, but it is not clear whether in areas of overlap they are in fact competing or making use of different niches.

The situation outside the breeding season is very poorly understood. Except for blackbirds and woodpigeons there are no data to indicate which species are resident, or which utilize other habitats outside the reserve as well. On balance the species composition is little different in winter and summer, the biggest changes being the absence of summer migrants in winter and the influx of goldcrests and redwings. The observed relative frequencies of different species however showed marked changes which could indicate movements in or out of the reserve, or possibly even just differences in behaviour.

The data on feeding in the pastures are still rudimentary. Although a species may feed in the habitat over several months the pattern and frequency of such feeding may vary considerably.

APPENDIX

Systematic List of Species Occurring in and around the Reserve, 1965 to 1971

Great crested grebe *Podiceps cristatus* (L.)*
Mallard *Anas platyrhynchos* L.
Teal *A. crecca* L.*
Mute swan *Cygnus olor* (Gmelin)*
Sparrowhawk *Accipiter nisus* (L.)
Kestrel *Falco tinnunculus* L.
Partridge *Perdix perdix* (L.)
Pheasant *Phasianus colchicus* L.
Moorhen *Gallinula chloropus* (L.)
Coot *Fulica atra* L.*
Oystercatcher *Haematopus ostralegus* (L.)*
Lapwing *Vanellus vanellus* (L.)*
Snipe *Gallinago gallinago* (L.)
Jack snipe *Lymnocryptes minimus* (Brünnich)
Curlew *Numenius arquata* (L.)
Whimbrel *N. phaeopus* (L.)*
Common sandpiper *Tringa hypoleucos* (L.)
Woodcock *Scolopax rusticola* L.
Great black-backed gull *Larus marinus* L.*
Lesser black-backed gull *L. fuscus* L.*
Herring gull *L. argentatus* Pontoppidan*
Common gull *L. canus* L.*
Little Gull *L. minutus* Pallas*
Black-headed gull *L. ridibundus* L.
Stock dove *Columba oenas* L.
Feral pigeon *C. livia* Gmelin
Woodpigeon *C. palumbus* L.
Turtle dove *Streptopelia turtur* (L.)
Collared dove *S. decaocto* (Frivaldszky)
Cuckoo *Cuculus canorus* L.
Little owl *Athene noctua* (Scopoli)
Tawny owl *Strix aluco* L.
Swift *Apus apus* (L.)*
Green woodpecker *Picus viridis* L.
Great spotted woodpecker *Dendrocopos major* (L.)
Lesser spotted woodpecker *D. minor* (L.)
Skylark *Alauda arvensis* L.*
Swallow *Hirundo rustica* L.
House martin *Delichon urbica* (L.)*
Sand martin *Riparia riparia* (L.)*

Carrion crow *Corvus corone* L.
Jackdaw *C. monedula* L.
Magpie *Pica pica* (L.)
Jay *Garrulus glandarius* (L.)
Great tit *Parus major* L.
Blue tit *P. caeruleus* L.
Coal tit *P. ater* L.
Marsh tit *P. palustris* L.
Willow tit *P. montanus* von Baldenstein
Long-tailed tit *Aegithalos caudatus* (L.)
Nuthatch *Sitta europaea* L.
Treecreeper *Certhia familiaris* L.
Wren *Troglodytes troglodytes* (L.)
Mistle thrush *Turdus viscivorus* L.
Fieldfare *T. pilaris* L.
Song thrush *T. philomelos* Brehm
Redwing *T. iliacus* L.
Blackbird *T. merula* L.
Wheatear *Oenanthe oenanthe* (L.)
Whinchat *Saxicola rubetra* (L.)
Redstart *Phoenicurus phoenicurus* (L.)
Robin *Erithacus rubecula* (L.)
Reed warbler *Acrocephalus scirpaceus* (Hermann)
Sedge warbler *A. schoenobaenus* (L.)
Blackcap *Sylvia atricapilla* (L.)
Garden warbler *S. borin* (Boddaert)
Whitethroat *S. communis* Latham
Lesser whitethroat *S. curruca* (L.)
Willow warbler *Phylloscopus trochilus* (L.)
Chiffchaff *P. collybita* (Vieillot)
Goldcrest *Regulus regulus* (L.)
Firecrest *R. ignicapillus* (Temm.)
Spotted flycatcher *Muscicapa striata* (Pallas)
Dunnock *Prunella modularis* (L.)
Meadow pipit *Anthus pratensis* (L.)
Tree pipit *A. trivialis* (L.)
Pied wagtail *Motacilla alba* L.
Grey wagtail *M. cinerea* Tunstall
Yellow wagtail *M. flava* L.
Waxwing *Bombycilla garrulus* (L.)
Starling *Sturnus vulgaris* L.
Hawfinch *Coccothraustes coccothraustes* (L.)
Greenfinch *Carduelis chloris* (L.)
Goldfinch *C. carduelis* (L.)
Siskin *C. spinus* (L.)
Linnet *Acanthis cannabina* (L.)
Redpoll *A. flammea* (L.)
Bullfinch *Pyrrhula pyrrhula* (L.)
Chaffinch *Fringilla coelebs* L.
Brambling *F. montifringilla* L.
Corn bunting *Emberiza calandra* L.
Yellowhammer *E. citrinella* L.
Reed bunting *E. schoeniclus* (L.)
House sparrow *Passer domesticus* (L.)
Tree sparrow *P. montanus* (L.)

*Recorded only from outside or over the reserve.

We would like to thank Andrew G. Duff, Edward J. Dawson and Ian Dodd for assisting with the fieldwork, Pamela L. E. Farhall for allowing us to use the results of her extensive series of winter observations, and Barry W. Roseman for supplying the data on woodpecker movements. B. O'C. Roberts kindly typed the manuscript.

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Survey of Bookham Common:

THIRTY-SECOND YEAR

Progress Report for 1973

General (G. Beven)

A new map of the Bookham Commons is now available. We are much indebted to H. E. Sandford and his helpers for the preparation, which has involved a great deal of work. It brings up to date the survey base map drawn by C. P. Castell in 1942, and includes new paths and the vegetation areas as shown in the vegetation map (*Lond. Nat.* **33**: 25 (1954)). The national grid reference system is superimposed in addition to the original grid references designed by C. P. Castell before the national grid was available.

We were very pleased to welcome a party of the East Hertfordshire Group of the Royal Society for the Protection of Birds on 6 May, and to be able to demonstrate some of the survey work.

The Bookham Local Management Committee of the National Trust has produced an attractive little pamphlet on Bookham Common (obtainable from The National Trust, Polesden Lacey, Dorking, Surrey, price 15p). It includes a simple map of the Common showing main paths, and some brief notes on the history and natural history, compiled with the assistance of members of our survey team. There are some small but pleasing sketches by Miss Vera Ibbett.

Over England and Wales as a whole 1973 was the driest year since 1964, and there have only been three drier years this century. The winter was especially dry, the nine-month period ending in March 1973 being the driest since 1949-50. At Kew, although May, June and September had more rain than usual, the total rainfall for the whole of 1973 was only 476 mm, i.e. 78 per cent of 608 mm which was the average over 35 years (1916-1950). This lack of water appears to have resulted from a reduction in the frequency of westerly winds, associated with a major change in the arctic producing "anticyclonic blocking". On the other hand the total sunshine of 1668 hours was only just above the average of 1514 hours at Kew (1931-1960), i.e. 110 per cent.

Vegetation (Ella M. Hillman)

1. Eastern Plain. Although the control of bracken *Pteridium aquilinum* by repeated cutting has encouraged the spread of other vegetation, hopes that some of the wet heath community, prevalent in the early years of the survey, would thereby be restored have now faded. The drier climate and better drainage of latter years have doubtless been the cause of its replacement by a dry heath association on this part of the Common with the highest soil acidity. Birches

Betula pendula are encroaching still further on the open area, and in an effort to conserve the open space before it becomes part of a continuous belt of woodland, birch seedlings were pulled up by a party of Girl Guides.

2. *Ruscus aculeatus* survey. This has now been organised among three observers so that less time will be spent, it is hoped, in locating the marked bushes. Progress has been severely interrupted mainly by the unreliability of the railway service, but information is accumulating for the next report. Eighty-seven bushes have been mapped and numbered, most of them marked, and 72 of them sexed. With more help some useful measurements could be made.

3. A list of brambles has been received from Alan Leslie, who with Alan Newton and Lady Anne Brewis identified them. The list is as follows:

Rubus averyanus W. C. R. Wats. (very rare)
R. balfourianus Bloxam ex Bab.
R. cissburiensis Barton & Riddelsd. (*R. separinus* Genev.)
**R. echinatus* J. P. Muell. (*R. discerptus* P. J. Muell.)
**R. flexuosus* Muell. & Lefèv. (*R. foliosus* inet.)
R. procerus P. J. Muell.
**R. pseudobifrons* Sudre
R. surrejanus Barton & Riddelsd. (*R. lasiostachys* Muell. & Lefèv.)
**R. ulmifolius* Schott

In the flora of the Common compiled by A. W. Jones (*Lond. Nat.* **33**: 25-47 (1954)) 17 species are recorded, 16 from a list made in 1945, which includes those marked with an asterisk(*).

4. Crater Pond. This pond, which had become filled with and surrounded by thick shrub, was cleared in 1972 and in December of that year held muddy water. In July 1973 aquatic plants *Alisma plantago-aquatica* and *Ranunculus flammula* were present in small quantities. By the autumn the pond was once more reduced to a damp hollow, and contained the moss *Acrocladium cuspidatum.* This pond, made by a bomb in 1940-41, was described by C. P. Castell (*Lond. Nat.* **34**: 16-21 (1955)) when these and many more plants were recorded.

5. The Plains. The hawthorn crop was judged by experienced observers to be a good one by Bookham Common standards. The one known tree of *Rhamnus catharticus* on the Common bore plentiful fruit in October; no male tree has so far been found on the Common and as the species is polygamous it is possible that this tree bears hermaphrodite flowers and should receive attention. The recording of vegetation alongside the cleared ditch has continued steadily.

Regeneration in the Isle of Wight Pond after Removal of Mud and Scrub (A. E. Le Gros)

For some years prior to the contractors cleaning out the Isle of Wight Pond it had been deteriorating to an oligotrophic condition (see *Lond. Nat.* **52**: 72-73 (1973)). There was a deep bottom layer of mud, an accumulation of many years, and there was an oxygen deficiency indicated by the red colour of the waterfleas. Most of the submerged water weeds had disappeared and the once large and varied molluscan population had been reduced to a few specimens of *Planorbis crista* and *Acroloxus lacustris.* It was interesting to watch how eutrophic conditions returned after the cleaning.

Although the contractors closed the drainage outlet ditch on 2 February 1973 the pond did not fill until the heavy rain storms of 5-6 May. Until then, apart from wildfowl, there was little visible sign of plant or animal life. Mr J. W. Coles, who took samples of the microfauna regularly through the year and who has kindly allowed me to make use of his notes, found on 15 May a rich plankton with rotifers (including *Brachionus* sp.) dominant.

In June there was a large crop of water-crowfoot, which appeared to be a hybrid between *Ranunculus peltatus* Schrank and *R. aquatilis* L. It had the large flowers and numerous stamens of the first species and the circular nectaries of the second. Crustacea and mosquito larvae were abundant and the waterfleas were pale.

There appeared in July a thick growth of *Potamogeton natans* L. which soon became dominant over the whole pond. The shallow water of the south shore had a bottom layer of a bright green alga (*Zygnema* sp.) while a starwort, perhaps *Callitriche hamulata* Kütz. was plentiful. Many wildfowl were attracted to the pond – in one day 22 mallard and 3 moorhen were counted. There was now a large population of insects, with waterbeetles and waterbugs common.

By September many plants of the water plantain *Alisma plantago-aquatica* L. were present in the SE and NW corners of the pond. The first dragonflies *Aeshna cyanea* Müll. appeared. Mr Coles noted a reduction in the plankton and found an empty shell of the great water-snail *Lymnaea stagnalis* L. This was almost certainly a "sub-fossil" of the pre-war population and no other pond snails were seen.

In October many large clumps of water milfoil *Myriophyllum alterniflorum* DC. were well distributed, while on the newly formed island there could be seen three zones of vegetation – *Juncus* at the margin and central *Salix* scrub, with *Rumex* sp. between them.

In December when there was a thick layer of ice over the pond Mr Coles found an active invertebrate population below it, including the amphipod *Crangonyx pseudogracilis*, a water boatman *Notonecta* sp., mayfly nymphs and calanoid copepods.

The bottom fauna (*Vermes*, etc.) was found to be sparse throughout the year because of the removal of the bottom mud but this should recover by next year.

Freshwater Invertebrates (J. W. Coles)

The following records are from Central Ditch (ref 8137):

10 June 1973. The mite *Platyseius major* (Halbert), family Ascidae (identified by K. H. Hyatt). Harpacticoid copepods and the nematode *Chromadorita leuckarti* (de Man), all associated with the alga *Cladophora* sp. (identified by Mrs J. A. Moore).

8 July 1973. The water snails *Lymnaea peregra* (Müller) and Jenkins' spire snail *Potamopyreus jenkinsi* (Smith) common (identified by K. Thomas).

Vermes: Hirudinea: The Medicinal Leech (A. E. Le Gros)

Bookham appears to be the last recorded station in the home counties for the medicinal leech (*Hirudo medicinalis* L.). Considered at the beginning of the present century to be extinct in Great Britain, it has been found to survive in a number of small pockets mainly in the west (Wales, the Lake District, western Scotland).

The leech was reported from "Bookham Pond" (presumed to be Isle of Wight Pond) on 2 April 1938 (*Proc. Trans. S. Lond. ent. nat. Hist. Soc.* **1938-39:** 38-39) and recently Mr A. E. Ellis (*Conchologist's Newsletter* **44:** 310 (1973)) has described how he was attacked by it in June 1947 when he was searching for mollusca and he was unable to staunch the flow of blood for two and a half hours. He tells me that the pond where this took place was not one of the main ones but a woodland pond heavily choked with leaves.

The near extinction of the leech in Great Britain may be attributed to two factors, firstly the over-collecting in the late 18th and early 19th centuries, and secondly to the gradual disappearance of hundreds of farm and village ponds used to water cattle and horses. Even in 1800 when William Wordsworth met the old leech-gatherer of his poem, leeches had become scarce because they were much sought after (see Dorothy Wordsworth's Journal of 3 October 1800.) By the middle of the 19th century when the Nottingham doctor Marshall Hall was campaigning against the practice of blood-letting the large demand for leeches was catered for by "leech-farms" mainly in France.

It is surprising that, in spite of the long association of the leech with medicine, comparatively little is known of its biology in the field, and much of that is recorded in vague terms. The young leech will attack a wide range of small animals: worms, insect larvae, amphibians and fish, but less is known about the adults. Mann (1964) states that it is said to require mammalian blood when adult and that slow breeding individuals may only breed at 3 or 4 years of age. Autrum (1958) states that the adult will take the blood of most vertebrates.

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Insecta-Diptera (A. E. Le Gros)

Mr A. E. Stubbs in the *Proc. Brit. ent. and nat. Hist. Soc.* **1972** records that a meeting of that society on 15 August 1971 was able to add nine additional species for the Common. These were: Tipulidae: *Pseudolimnophila lucorum* (Meig.), *Tipula fulvipennis* Deg.; Mycetophilidae: *Neoplatyura modesta* (Winn); Dolichopodidae: *Drymonoeca aulica* (Meig.); Platypezidae: *Opetia nigra* (Meig.); Sciomyzidae: *Pherbellia griseola* (Fall.); Drosophilidae: *Chymomyza fuscimana* (Zett.); Muscidae: *Fannia incisurata* (Zett.); Anthomyiidae: *Calythea albicincta* (Fall.).

Birds (G. Beven)

Population Studies in Oak-wood

The breeding season census was repeated in this 16 hectare (40 acre) sample of dense interior pedunculate oak-wood (Eastern Wood). The number of territories of singing males of selected species over the last 11 years is shown in Table 1.

TABLE 1. The number of territories of singing males of selected species in Eastern Wood in each year.

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Great tit	12	17	17	12	16	19	14	13	13	12	18
Blue tit	19	19	22	17	16	20	19	20	15	16	19
Coal tit	2	5	4	3	8	6	7	5	4	7	9
Marsh tit	3	1	1	3	3	3	3	3	2	2	4
Long-tailed tit	0	0	1	2	2	1	1	2	3	2	3
Nuthatch	2	5	5	5	7	5	3	5	5	4	6
Treecreeper	1	1	2	2	2	4	4	3	5	3	1
Wren	1	5·5	11	17	25	26	24	25	17	26	27
Mistle thrush	2	2	3	2	1	1	2	2	2	2	2
Song thrush	4	7	7	8	10	7	7	7	9	6	6
Blackbird	8	10	12	11	12	11	13	9	14	12	6
Robin	21·5	32	37	37	42	43	44	36	44	37	35
Blackcap	5	3	4	7	6	3	6	1	3	4	3
Garden warbler	2	2	4	1	1	1	1	1	0	0	0
Willow warbler	2·5	1·5	4	4	2	6	2	2	0	0	0
Chiffchaff	2	5	7	6	6	3	3	4	1	1	4
Dunnock	4	5	5	4	8	6	6	3	2	1	0
Starling	5	5·5	10	6	8	12	7	8	8	6	7
Chaffinch	5·5	7	8	7	6	4	4	3	6	8	3

The population of great and blue tits, wrens and robins thus remain high. The previous winter was again classified as fairly mild.

Scrub and Grassland

The spring census of the number of territories of singing males was again made on 39 hectares (96 acres) of scrub and grassland in 1973 (G. B. and W. D. Melluish). The number of territories of selected species over the last 10 years is shown in Table 2.

TABLE 2. The number of territories of singing males of selected species in the scrub and grassland in each year.

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Pheasant	2	2	3	3	2	7	3	5	7	2
Woodpigeon	1	2	4	1	1	6	3	5	7	7
Turtle dove	5	4	3	5	3	7	4	8	12	11
Green woodpecker	0	1	4	4	4	1	1	1	1	3
Long-tailed tit	2	3	4	5	6	6	5	4	6	6
Wren	2	3	9	10	15	14	18	14	22	19
Song thrush	8	8	7	10	9	9	14	15	13	14
Blackbird	15	8	13	17	15	15	20	15	16	16
Robin	23	23	15	21	23	23	22	18	21	25
Nightingale	1	0	2	3	4	4	5	4	5	3
Grasshopper warbler	2	4	6	4	5	6	5	5	4	4
Whitethroat	12	17	17	22	16	11	14	12	13	17
Willow warbler	20	14	19	27	21	26	14	18	22	20
Dunnock	11	15	13	18	12	12	13	10	13	9
Linnet	1	4	4	4	1	2	0	1	0	1
Redpoll	2	3	5	4	4	6	6	4	4	5
Chaffinch	18	13	13	14	9	12	17	11	14	14
Yellowhammer	9	7	9	7	8	7	5	8	7	4
Reed bunting	3	2	5	6	5	3	3	5	5	4

The high woodpigeon and turtle dove numbers have been maintained. The wren, robin, song thrush and blackbird populations remain large, and the whitethroats have increased to the highest figure since 1967.

The Status of the Blackcap and Garden Warbler on Bookham Common

The blackcap *Sylvia atricapilla* and garden warbler *S. borin* occupy such very similar habitats that it is of considerable interest to examine their density and population fluctuations in the oak-wood and scrub on Bookham Common. Both species are said to breed in open mixed woodlands with thick scrub, especially bramble, but the garden warbler seems to prefer a lower and denser shrub growth, feeding chiefly in the bushes and sometimes breeding in the absence of trees. On the other hand the blackcap feeds mainly in trees and generally at a higher level.

In the 16 hectare (40 acre) sample of dense interior pedunculate oak-wood (*Quercus robur*) over 24 years (1949-1973, excluding 1957 when there was no count), the numbers of "singing male" territories of blackcap averaged 3.5 (8.75 per 100 acres) whilst that of garden warblers averaged 2.4 (6.0 per 100 acres); this gives a ratio of about

3:2 (blackcaps : garden warblers). However during this period there was considerable variation in numbers from year to year, blackcaps varying from 2.5 to 17.5 territories per 100 acres, and garden warblers from 0 to 17.5 per 100 acres. It is worth noting that garden warblers have declined in numbers since 1966. Thus after excluding this recent period of decline of the garden warblers, the number of territories of blackcaps (1949-1965) averaged 3.2 per 40 acres and of garden warblers 3.3 per 40 acres, that is a ratio of 1:1 for this entire period (Table 3a).

Table 3. The numbers of territories of singing male blackcaps and garden warblers each year in oak-wood and scrub. NC — no count.

(a) 40 acres — oak-wood

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Blackcap	3	3	4	3	2	3	2	3	NC	3	4	2
Garden warbler	3	3	3	3	4	2	4	4	NC	7	3	3

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Blackcap	4	3	5	3	4	7	6	3	6	1	3	4	3
Garden warbler	2	4	2	2	4	1	1	1	1	1	0	0	0

(b) 96 acres — shrub

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Blackcap	1	2	1	2	2	2	3	4	7	7
Garden warbler	4	1	0	1	2	2	3	5	5	4

In 39 hectares (96 acres) of scrub (chiefly hawthorn *Crataegus*), sloe *Prunus*, and rose *Rosa* with larger trees, especially oaks *Quercus* mainly round the outskirts, during the period 1964-1973 the blackcap averaged 3.1 territories whereas the garden warbler averaged 2.7 territories. Thus the ratio of the two species is also about the same in this habitat. Again there was considerable variation from year to year, in the case of the blackcap from 0 to 7 territories per 100 acres, and garden warbler from 0 to 5 (Table 3b).

Over the years 1949 to 1973 the ratio of blackcaps to garden warblers varied, in oak-wood from 7:1 to 3:7, while between 1964 and 1973 in scrub it varied from 2:1 to 1:4. Eric Simms in his *Woodland Birds* (1971) states that there were equal numbers of the two species in the Severn and Stour Valleys between 1946 and 1966, and he reports that garden warblers at Hopwas near Tamworth and in the Wyre Forest may outnumber blackcaps by 6 or 7 to 1, while in the Malverns blackcaps outnumber garden warblers by 7:1. But probably, as at Bookham, the ratios may change from year to year.

On Bookham Common, therefore, the density of garden warblers seems on the average to be about twice as great as in oak-wood with scrub (6.0 per 100 acres) as in shrub with scattered trees (2.7 per 100 100 acres). The density of blackcaps is on average nearly three times as great in oak-wood (8.75 per 100 acres) as in shrub (3.1 per 100 acres).

In the shrub area the numbers of both species have been maintained on the whole in spite of the fluctuations. In fact the blackcap seems to be fairly steadily increasing, especially in the last three years, possibly because of the increasing size of the shrubs and trees. However in the oak-wood sample, whereas the blackcap numbers have been fairly well maintained, the garden warblers have declined since 1966 and in the last three years none have been present. The blackcap numbers at Bookham seem to reflect a general trend in the country as shown by the common bird census of the British Trust for Ornithology, in that since 1964 the population in woodland has remained fairly constant but on farm land it has been increasing since 1962 (*Brit. Trust. Ornithology News* **62** (1973)).

Study of the distribution of the breeding birds on the scrub shows that 26 out of the total of 31 blackcap territories (84 per cent) occupied areas with taller trees, expecially on the outskirts of the scrub. On the other hand only 11 out of 27 garden warbler territories (40 per cent) were in areas with taller trees, leaving 60 per cent in areas of scrub with few trees. There is some evidence to suggest that garden warblers have recently increased where the scrub is increasing in density.

Other Notes on the Birds

There were no records of little grebes in 1973, probably because of the draining and clearing of the Isle of Wight Pond in the early part of the year; possibly for the same reason the only record of the mandarin duck was of one pair noted during the spring frequenting the vicinity of Kelsey's Pond (D. Macer-Wright & A. S. Thorley). There were eight sightings of sparrowhawk between December 1972 and May 1973; this is a greater number of records in a short period than have been noted since regular breeding of this species ceased in 1959. One or two woodcock were roding in spring. On 8 April 1973 a willow tit was watched excavating a nest hole in an old hawthorn (ref. 466) and another made a hole in a birch stump (ref. 646) on 1 April 1973. A tree pipit singing on Bayfield Plain on 10 June 1973 was not heard subsequently. A pair of hawfinches was seen on 10 January 1973 (D. Macer-Wright). A number of house sparrows were making domed nests in hawthorns at the edge of the Common in 1970 (ref. 913) and in 1973 (ref. 421).

Conservation Report 1973

by L. M. P. Small

Although there is nothing in the last year to compare with the importance of the Staines Moor Enquiry, we have been, as usual, very busy.

The review of the list of sites of special scientific interest for Greater London has continued, and we have supplied information to help with the preparation of a final list. This is now finished and we hope it will soon be approved. We hope to publish the list in due course.

We have lost, by death, two valuable members of this Committee. Mr Freddie Reynolds, Conservation Officer of the Surrey Naturalists' Trust, died in August, and not long afterwards Mr Stan Jermyn, Secretary of the Essex Naturalists' Trust, died after a heart attack. We shall miss their help and advice, and the trusts concerned will be hard pressed to replace them.

There has been much activity in Kent and we are fortunate in having a representative of the Orpington Field Club on the Committee. The worst threat is probably that to Crofton Heath by a housing development plan. Not only is this area green belt land, but it includes half an acre of registered common land and is a proposed SSSI. It includes woodland and a fine marshy area, and has an impressive list of plants and Lepidoptera. There will probably be a public enquiry in 1974. It is sad that Mr Swain, who spent so many years working on the area and preparing a detailed report, should have died just before his knowledge and enthusiasm would be most needed.

There was an application to clear fell an area of woodland near Pratt's Bottom, a site for the rare milkwort *Polygala amara*. This fortunately has been refused. In the same area planning permission for a golf course on New Barn Farm, which would have entailed the destruction of a fine sunken lane, was also refused.

The conference centre of the Royal Arsenal Co-operative Society at Shornells, Plumstead, was proposed as a nature study education centre, and after consultation the Chairman was asked to plan a nature conservation weekend. Mr Brightman of the Kent Trust and Mr Roberts of the Selborne Society joined with her, and the event was a great success. It is now hoped that a centre will be established for natural history education for both children and adults, probably organised by the Inner London Education Authority.

Surrey has had many problems and among them was a planning application from the Whitgift Foundation to build a school on Croham Hurst golf course which forms a buffer zone for the important SSSI of Croham Hurst itself. This has been refused but the foundation may well appeal. The Croydon Natural History and Scientific Society (also represented on our Committee) has been much concerned with the conservation of bats in the area. A survey has been carried out and a report will be published. Some disused mines have been gated to exclude intruders and prevent disturbance to bats, and plans are being made to do this in other places. Beddington Sewage Farm, formerly the site of much activity by Society ornithologists is now under two threats: the M23 will probably cross it, and building development is also proposed. Since the farm has been modernised and irrigation has virtually ceased the ornithological interest is no longer as great as it used to be.

We have been asked to intervene in a number of developments which, on investigation, proved to be of amenity interest only. However, every one is carefully considered before a decision is made. We were asked to look at St Mary's churchyard, East Ham, to see if it could be used for natural history work among school children and the Chairman visited it several times. Tower Hamlets Cemetery was also considered for this purpose, but it was felt that in an area sadly lacking in open space vandalism would probably render any plans impractical. The fact that so many threats are outside our terms of reference should not stop anyone from reporting them. All are considered and if we can help we certainly do.

We have been successful in obtaining co-operation from local authorities through their parks departments. We are often in touch with the Greater London Council, and in Ealing have secured modification of hedge and verge cutting near Horsenden Hill. In Croydon a change in management has protected species of Orthoptera. The London Borough of Barking has prepared a plan to improve the valley of the Beam River in an area called the Dagenham corridor. Such far-sighted plans for a rather dreary area are most unusual. A roost of pied wagtails in a small plane tree in the busy junction of Hammersmith Broadway was checked to see if anything ought to be done for the safety of the birds in this unusual site, but they appear to be as safe as possible.

The River Wandle, always much polluted and recently severely confined in major flood prevention work, has inspired residents in the Wallington area to form a Wandle Group, with representatives from local amenity and natural history bodies. They intend to work for the improvement of the river and plan to publish a report on the subject.

The Hertfordshire and Middlesex Naturalists' Trust have established a conservation corps and it is hoped they will soon be active in both counties. Now we have their Conservation Officer on the Committee co-operation is easy. The Middlesex part of their area is becoming more active and this will be of great help in covering the London Area adequately.

The work of guarding London's wildlife is non-stop and there are far too few workers in the field. The Committee needs new members and reporters willing to act as its eyes and ears in notifying threats in their own areas. The Chairman and Secretary are always glad to hear from such people.

Botanical Records for 1973

by J. Edward Lousley

It seems that botanists, like farmers, are never satisfied with the weather. The rainfall in London (St James's) in 1973 was only 500 mm, about 84 per cent of the average. But it was the winter months at the beginning and end of the year that were exceptionally dry, while April to July were exceptionally wet. So the rain came at the wrong time, and the worst sufferers were spring ephemerals, which were short of water for germination and got little encouragement from a cold and wet April. May was horribly wet, and unsettled weather with spells of thundery rain continued until mid-August. On 19 June as much as 63 mm of rain fell in 4·5 hours at Chessington. Better weather in August and the first half of September, with a combination of warmth and moisture, produced a better crop of autumn aliens on refuse tips than we have had for several years.

Two records of exceptional interest reported in this note are those of *Orobanche hederae*, the ivy broomrape, from Kent, and of *Utricularia vulgaris*, the greater bladderwort, from Surrey. Of the first our only records have been from Kew Gardens and a cemetery, and of the second the only earlier record south of the Thames was from Runnymede on the boundary of our Area. The records from the Kent marshes and from Walthamstow Reservoirs are particularly useful.

In this report grid references are given in accordance with the Society's recording scheme (*Lond. Nat.* **51** : 20-21 (1972)). 'Tetrad' references are cited as far as possible, and failing this 'centads' i.e. 10-kilometre squares of the national grid. In both cases these appear in brackets following the place names. The nomenclature is based on the *List of British Vascular Plants* (1958) prepared by J. E. Dandy, and for species in that list authors' names are omitted.

V.C. 16, West Kent

'The Flora of Bexley', a useful booklet by Mrs M. C. Foster, who has supplied us with many records from the area, has been published by the London Borough of Bexley. She is to be congratulated on this up-to-date account, which includes confirmation of the continued existence of some interesting species. These include *Ranunculus sardous* from Crayford Ness (57T28). The marshes along the Thames are being steadily destroyed by industrial and other activities and it is therefore especially important to keep our records up-to-date. Lists of plants seen on Dartford Marshes (57) in 1973 by J. R. Palmer include *Groenlandia densa*, and *Potamogeton pectinatus;* from Littlebrook Marshes (57T66) *Juncus gerardii*, *Spergularia media*, *Puccinellia maritima* and *Ruppia maritima*, and from Stone Marshes

(57T64) *Puccinellia fasciculata*. He has also revisited the pit at Stone (57T64) where Mrs A. G. Side found *Pyrola rotundifolia* in 1962. There were still four non-flowering clumps in 1973, and large quantities of *Calamagrostis epigejos* (as I found in 1963), and *Orobanche minor* and *Hieracium scotostictum* (det. C. West). Mr Palmer also reports *Orobanche hederae* found by a road at Stone (57T84) by Mrs J. Denton in 1968 and by Mr & Mrs P. C. Hall in 1972, and also on ivy at another place on the same road (57T64) by W. Coultry and J. Dannreuther in 1973. These are our first records of ivy broomrape from Kent. In a sand-pit at Horns Cross (57T64) he found about fifty plants of *Trifolium glomeratum* growing with *T. striatum*, *Spartium junceum* appearing well established, and *Beta trigyna*.

Darenth Wood (57) produced the first record of *Hieracium vulgatum* from Kent for this century. Mr Palmer found it in some quantity deep in the wood in a place where it was thought unlikely to be casually introduced, and it was named by Dr West. Here too he found seedlings of *Euonymus japonicus* (27T60) and (27T62), which also occurred in a wood near Stone Halt (27T64). A surprising record is *Thymus vulgaris* in some quantity on bare ground near Darenth Wood (57T62) and obviously spreading—it usually grows on the tops of walls. Weeds in an abandoned field of red cabbages near Swanley (57T28) included *Trifolium aureum* in abundance, about 15 plants of *T. angustifolium* L., and medicks, which suggested the influence of wool shoddy. A rubbish tip at Crayford (57T26) produced *Solanum sarrachoides* (which may be persistent in the area as B. Wurzell found it on allotments in 1964), *Bromus madritensis* and *Amaranthus standleyanus* Parodi, found by J. R. Palmer and E. Clement. The former also found *Lavatera trimestris* L. as an arable weed near Green Street Green (57T80).

A very interesting refuse tip at Stone (57T64 & 57T44) produced over 300 plants of *Xanthium echinatum* Murray in ripe fruit, *Ambrosia artemisifolia*, and *Hibiscus trionum* L., with many other aliens seen by J. R. Palmer, E. Clement, and other members on an LNHS excursion. *Galium parisiense* subsp. *anglicum* is still on old walls at Farningham (56T48), Chelsfield (46T64) and Lullingstone (56T24), as reported by R. M. Burton in a useful list. At Lullingstone he reports *Galeopsis bifida* growing on the same wall.

V.C. 17, Surrey

For Surrey B. R. Radcliffe provides our first record of *Utricularia vulgaris* subsp. *vulgaris* from south of the Thames. In August he found it abundant in flower in a pond on Epsom Common (25T08) where it has probably arrived fairly recently. In Ashtead Park (15T88) he found several clumps of *Inula helenium*, and reports *Polystichum setiferum* from 15T68, 16T60, 25T68 and 25T84. Mrs K. M. Lunnon found abundant *Nymphoides peltata* in a pond and

Ranunculus lingua in a ditch on Ditton Common (16T46)—both species are sometimes planted. Mrs L. M. P. Small directed me to an area of old chalk workings at South Coulsdon (35T08) which produced a long list of native and introduced plants. From here B. Wurzell later reported *Poa compressa* and *Erucastrum gallicum*. *Myrrhis odorata* appeared near Springwell Cottage on Wimbledon Common (27T20) where it was found by Mrs M. Becher (comm. R. M. Burton).

On 2 June a field meeting led by Miss Joan Stoddart to Ham confirmed a number of old records. Especially pleasing was the abundance of *Lathyrus aphaca*, which she had recorded ten years earlier (17T62). A survey of the whole Ham riverside is being carried out by Mr Nigel Hepper and others. He tells me that *Dianthus deltoides* and *Scilla autumnalis* (17T62) are still to be found—a long search by Mrs J. E. Smith and myself in September failed to reveal the latter at Hurst Park (16T48) where we both knew it earlier. Mrs B. Whitcombe showed me a fine colony of *Poa compressa* on a wall near the river in Richmond (17T64) which could be the place where R. W. Robbins found it in 1931.

V.C. 18, South Essex

Thelypteris palustris is known as a native in only one place in the London Area—on Coopersale Common, where it is under threat from a new road. I am told by Mr R. M. Payne that plants from here have been planted out in about 15 places in Epping Forest. No doubt these will puzzle our recorders, and plants found in other places will be under suspicion of having arisen from spores from these transplants.

The maritime flora of Rainham Marshes (58T00) listed by Miss M. E. Kennedy and D. H. Kent in 1972 included *Beta maritima* subsp. *maritima*, *Spergularia marina*, *Plantago maritima*, and *Agropyron pungens;* they also had *Bromus willdenowii* and *Onopordon acanthium*. At Purfleet (57T48) they found *Helictotrichon pubescens*, which we had not recorded previously from Essex. Brian Wurzell visited in 1972 the well known chalkpit at Grays (67T08) and found several new plants: *Bunias orientalis*, *Juglans regia*, and *Ailanthus altissima*, while *Medicago* x *varia* was still on the roadside verge just outside (67T06), where I collected it in 1949.

There can have been few field meetings of the Society when as many scarce and interesting plants have been seen as on the one to Walthamstow Reservoirs led by Brian Wurzell on 14 July 1973. These included a wonderful range of *Rumex* species and hybrids which it would be difficult to equal elsewhere, of which *Rumex cristatus*, *R. conglomeratus* x *crispus*, *R. conglomeratus* x *palustris*, and *R. palustris* are some of the less common ones. *Torilis nodosa* was on the bank by one reservoir, *Crepis biennis* by the High Maynard, and *Salvia verticillata*, and *Hordeum jubatum* near Coppermill Lane. We saw the plant from here recorded as *Bromus pumpellianus* Scribn. (see *Lond. Nat.* **49** : 18 (1970)) but it was mixed with abundant *B. inermis* into which it seemed to grade. All the above are in 38T48. From 38T46 B. Wurzell reports *Catabrosa aquatica* on Walthamstow Marshes in 1973, and *Amaranthus deflexus* on the River Lea towpath by Hackney Marshes in 1962.

V.C. 21, Middlesex

Before the meeting on 14 July I found fine *Rumex cristatus* and handsome plants of its hybrid with *R. obtusifolius* by the canalised River Lea near Tottenham Lock, both known to Mr Wurzell. On a disused tennis court, also in 38T44, he showed us very convincing *Epilobium adenocaulon* x *hirsutum.* Near Alexandra Palace, in 29T80, Mr Wurzell found *Plantago coronopus* and *Sieglingia decumbens* in heathy grassland, and one large tree of *Sorbus torminalis* in relict woodland. Another fine tree and seedlings were also found in Bayhurst Wood, Ruislip, 08T68, by Ian Johnson in 1972.

A few plants of *Sisymbrium irio* were found by D. H. Kent in Carville Hall Park South, Brentford (17T86). A cultivated fern, *Pteris cretica* L., which has only been previously reported from Kent, was found by Mrs I. J. McLean established on the brickwork of a basement by Bond Street, Ealing (18T40) and was seen there later by Mr Kent. *Fumaria muralis* subsp. *boraei* was found by C. C. Townsend on Fulwell Golf Course (17) and by Miss M. E. Young (det. Dr J. G. Dony) in the parish of Chelsea Old Church (27). *Pimpinella major* is a very local species in Middlesex being virtually confined to the Barnet-Cockfosters area in the north-east. It was therefore something of a surprise when J. L. Gilbert reported a single plant in 1971 and then plentiful in 1973 from by the footpath between Windmill Lane, Osterley, and Trooper's Crossing (17T48). A plant of *Epipactis helleborine* was found in Horsenden Lane, Perivale (18T62) by A. Beaumont (comm. P. J. Edwards), and a small colony of *Papaver argemone* near the railway between Boston Manor and Brentford (17T66) by J. M. Mullin. Aubergine plants, *Solanum melongena* L., were found by Mrs McLean growing in a back alley with parking lots between Tottenham Court Road and Rathbone Place (28T80).

Two grasses, which are amongst our most exciting records of the year, were found in a paddock by Perivale Wood (18T62) by Dr C. E. Hubbard. *Agrostis castellana* Boiss. & Reut. is a native of the Iberian Peninsula and north Africa, closely allied to *A. stolonifera* and sometimes treated as a subspecies of this, which was introduced with grass seed. It is being increasingly recognised in areas sown with grass and has also turned up on refuse tips in Norfolk. *Festulolium braunii* (K. Richt.) A. Camus is the hybrid between *Festuca pratensis* and *Lolium multiflorum*, and also has not been previously reported for our records.

We are grateful to the following for their contributions to our botanical records during 1973: A. Beaumont, Mrs M. Becher, R. M. Burton, E. J. Clement, W. Coultry, J. Dannreuther, Mrs J. Denton, Dr J. G. Dony, P. J. Edwards, Mrs M. C. Foster, J. L. Gilbert, Mr & Mrs P. C. Hall, Nigel Hepper, Dr C. E. Hubbard, Ian Johnson, Miss M. E. Kennedy, D. H. Kent, J. E. Lousley, Mrs I. J. McLean, Mrs K. M. Lunnon, J. M. Mullin, J. R. Palmer, Ron Parker, R. M. Payne, B. R. Radcliffe, Mrs L. M. P. Small, Mrs J. E. Smith, Miss Joan Stoddart, C. C. Townsend, Prof. E. H. Warmington, Dr C. West, Mrs B. Whitcombe, B. Wurzell and Miss M. E. Young.

Obituary

TERRY GOMPERTZ, 1917-1973

The increasing complexity of modern ornithology means that many fewer amateurs are now able to make any major contribution. Terry Gompertz was one of the select minority to achieve this distinction. Yet she did not become seriously interested in birds until she was nearly 40 years of age, and she carried out her studies entirely in the London Area. After ten years as a producer with the BBC she became a freelance writer and broadcaster, and soon after grew interested in one of the most common species round her Hampstead home, the feral pigeon. This, like other common birds, had been relatively neglected and her paper on London pigeons (*Bird Study*, 1957) sparkled with new material and ideas, and, like all her work, was elegantly and vividly written. On moving to Pinner Hill, she turned to the great tit, studying the behaviour and recording the voices of all the birds in the district (and some further afield), not least the famous male Johnny, who held a territory in her garden for twelve years. Her keen and original intelligence, combined with a skilful use of recording techniques, enabled her to illuminate the vocabulary of this lively and vocally diverse species, resulting in key papers in *British Birds* (1961) and *Die Vogelwelt* (1967, 1968). Before her tragic and early death she had been working on a major study of song variation in the local great tit population and it is good to know that her friend and keen collaborator in all these studies, Miss Rosemary Jellis, is now preparing this for scientific publication. The study of bird voice has been relatively neglected in modern times; Terry's work, acclaimed by professional researchers, should also be a valuable inspiration to the increasing number of amateurs who are taking up sound recording.

Terry Gompertz was an enthusiastic member of the London Natural History Society, where her warm and lively personality made her many friends. They will mourn the loss of one its outstanding ornithologists who combined scientific insight and pertinacity with an ability to communicate her ideas both to the scientific world and, through her articles and original and popular broadcasts, to a wider audience.

STANLEY CRAMP

A Review of the Macrolepidoptera of the London Area for 1972 and 1973

by C. G. M. de Worms

The biennial review of the macrolepidoptera in the London Area covering the years 1972 and 1973 is undertaken on the same lines as the previous one for 1970 and 1971 which appeared in *The London Naturalist* **51**: 28-38. As emphasised in the latter survey, the Watsonian vice-counties into which the Area is divided will still be maintained for the purpose of natural history recording after the geographical reorganisation of the county boundaries in April 1974.

As in previous reviews I am once more greatly indebted to many members of the Society and other collectors who have kindly submitted lists of their captures together with other important records for the period. Towards the end of 1973 '*A survey of the macrolepidoptera of Croydon and north-east Surrey*' was published under the auspices of the Croydon Natural History Society. In this comprehensive work the authors Mr K. G. W. Evans and his son Mr L. K. Evans have added a most valuable list of records to our knowledge of the lepidoptera of the southern region of the Area, with several records of new species and localities in Surrey.

The weather in each respective year usually has a great impact on the numerical prevalence of our butterflies and moths, and often on the arrival in this country of many migrant species. The seasons of 1972 and 1973 were in complete contrast to one another. Both years began with mild winters, but the first half of 1972 will be remembered for the month of June, which was one of the wettest and most inclement on record, and had a marked effect on bringing about an apparent paucity of insects. It was not till the late summer and autumn that any long periods of sunshine supervened, mainly during September and October. In contrast, the summer of 1973 will be remembered as one of the best and warmest in recent years. The warmth and sunshine brought out a spate of butterflies and moths together with many migrants, some of which visited the London region. These records will now be analysed for each vice-county as well as with a general introductory survey.

The years 1972 and 1973 will indeed be memorable, especially as regards the moths, of which no less than six new species were added to the overall list for the Area. One of these, a small noctuid, was new to science, while two others proved to be great rarities with only one other British record in each instance. Besides these remarkable visitors there were several other rare migrants, particularly among the hawk-moths, and several unexpected species have found their way into the Area. Dr J. D. Bradley has once more been in charge of running the mercury vapour moth-trap in the grounds of

Buckingham Palace for the fourteenth year in succession. This has once more produced a number of interesting insects for the centre of the metropolis.

In spite of the good summer of 1973, though there was a profusion of some of the commoner butterflies, there were virtually hardly any records of any special rarities in the Area. The only two of note were the capture and later release on 22 July of *Nymphalis antiopa* L.* (Camberwell beauty) in Regent's Park by Mr Timothy Ruck, and on 31 July another specimen of this fine butterfly was captured near Keston, Kent, thus pointing perhaps to an immigration in the south-eastern part of the country. The vanessids swarmed in the late summer of 1973, especially the red admirals and small tortoiseshells in most gardens in and around London, but the commas were far from numerous and there were only a very few records of the painted lady in the Area. Another species that was in phenomenal numbers on most of the Surrey downs in August 1973 was *Lysandra coridon* Poda (the chalkhill blue). This insect was abundant in the Box Hill region and on the Banstead and Epsom Downs. That charming little butterfly *Strymonidia w-album* Rott. (the white-letter hairstreak) has been reported from several new localities in Surrey, notably around Chertsey and on Arbrook Common near Esher. There have been, however, only very few reports of *Celastrina argiolus* L. (the holly blue) in the Area for this period, but Mr Pink saw some fifty insects of *Thecla quercus* L. (the purple hairstreak) in one day at the end of July 1973 on Wimbledon Common.

Turning to the moths, the Sphingidae have indeed excelled themselves, chiefly during 1973, for on 26 May Mr E. Wild was amazed to find in his trap at Selsdon a magnificent specimen of *Hyles euphorbiae* L. (the spurge hawk), of which only five others have been noted in the Area this century. Another member of this family, *Hyles gallii* Rott. (the bedstraw hawk), staged a vast immigration in the summer of 1973 with records as far north as the Orkneys, but the only one that seems to have graced the fringe of our Area was taken by Mr Peter Baker near Thorpe in Surrey at the end of July. That spectacular insect *Acherontia atropos* L. (the death's head) was also fairly prevalent in the south of England during September, together with the other frequent migrant *Herse convolvuli* L. (the convolvulus hawk) which does not appear to have penetrated the Area. However, two grand specimens of the death's head were reported: one taken at Enfield by Mrs I. J. Gray on 7 September and sent to the Natural History Museum in London, and the other on 17 September at Warlingham, Surrey, by Mr R. A. Betteridge. Another somewhat local sphingid seen in phenomenal numbers was *Deilephila porcellus* L. (the small elephant) at a light-trap run in Bushy Park, near

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*Brackets are omitted from authors' names in accordance with current practice in this group.

Hampton Court. Mr Eric Classey recorded no less than 450 on 19 nights between 29 May and 19 June 1973 including 86 on 8 June.

As regards the impressive sequence of noctuid moths new to the Area, the pride of place must go to the very small **Schrankia intermedialis** (the autumnal snout) described by Mr J. Reid, who captured the two original specimens in Broxbourne Woods, Herts., in October 1971. In the *Entomologist's Gazette* **23**: 221-225 (1972), he points out the markings and also the differences in the structure of the male genitalia which distinguishes this insect from its near relative *S. costaestrigalis* Stephens (the pinion-streaked snout). Since *S. intermedialis* has not been recorded elsewhere, it is a species new to Britain and also to science and a most spectacular addition for the London Area. So far no other specimens have come to light either in 1972 or in 1973.

Two other visitors to the Area call for special mention. On 17 July 1972 Mr Bernard Skinner was amazed to discover in his trap at West Norwood a specimen of **Apamea lateritia** Hufn. (the scarce brindle), of which only one other example had ever been recorded in Britain: in Glamorgan in 1887 and now preserved in the National Museum of Wales at Cardiff. Still more remarkable is that the very same same night Mr D. O'Keeffe distinctly saw another moth of this species in his trap at Bexley, Kent, but it escaped while he was endeavouring to box it. The presence of these two insects so far apart on the same date indicates an immigration of this species, which is prevalent across the Channel.

During August 1972 Mr Lance Durden, who was on holiday from his school, ran a light-trap at his home at Shepperton, Middlesex. He noted down and identified most of the species, but one insect puzzled him as he could not find it in the usual literature. During 1973 he showed it to Mr E. W. Classey who lived nearby at Hampton and took it to the Natural History Museum. It was identified there as **Actebia fennica** Tausch. (Eversman's rustic), an insect, as its name implies, emanating from Scandinavia and also prevalent in northern Canada. The only other British example was taken in a wood at Chesterfield as long ago as 1850 and is now preserved in York Museum. This recent specimen was generously presented to the national collection at South Kensington.

There are two other newcomers which have found their way into the Area. **Lithophane leautieri** Boisd. (Blair's pinion), was recorded by Mr R. I. Lorimer at Totteridge in early November 1972 with another example at Oxted on almost the same date recorded by Mr M. Cock. This autumnal species was first reported by the late Mr K. G. Blair in 1952 from Freshwater in the Isle of Wight. During the past 20 years this new arrival from the Continent has spread steadily eastwards and westwards along the south coast, chiefly wherever *Cupressus macrocarpa*, its larval food plant, flourishes. In more recent years it has penetrated well inland as far as the River

Thames. The other somewhat surprising moth to have reached the Area is **Eumichtis lichenea** Hübn. (the feathered ranunculus), another insect of the autumn, usually to be found along our southern and western seaboards. It is therefore surprising to learn of a specimen taken near Addiscombe in October 1969 by Mr L. K. Evans and another one at Totteridge by Mr R. Lorimer in October 1973, evidently denoting an extension of range to inland areas.

Other records of note among the noctuid moths during the period include that grand species *Eurois occulta* L. (the great brocade) taken by Mr D. O'Keeffe at Bexley on 31 July 1973. It is generally assumed that records of this insect in the south of England are immigrants, since its normal haunts are the Highlands. Another very uncommon visitor to the Area is *Rhyacia simulans* Hufn. (the dotted rustic). A female was taken by Mr Lorimer at Totteridge in October 1972, only the fourth record for the London region. Another rare species which was only recorded in 1972 was *Leucania unipuncta* Haworth (the white-speck) taken by Mr d'Arcy at Broxbourne in October 1971. A species which seems to be becoming generally widespread in the Area is *Hadena compta* Borkh. (the varied coronet) which has now turned up as far west as Bucks. *Cucullia asteris* Schiff. (the starwort shark) was reported in 1973 from several new localities in Essex, and even as far in London as New Ham by Mr W. Coster, together with larvae of *Cucullia absinthii* L. (the wormwood shark), a species which has decreased lately in the Area after becoming comparatively abundant during and after the last War on bomb-sites. There were several records in 1973 of the semi-migrant species *Spaelotis ravida* Schiff. (the stout dart) which does not often visit the Area; these were in Herts., Essex and Surrey.

As regards the geometers yet another discovery was the newly-recognised member of the pug family, **Chloroclystis chloerata** Mab. (the sloe pug). In 1971 Mr Pelham Clinton bred this species from larvae beaten from sloe blossom in Surrey. In the spring of 1972 these small larvae were found to be abundant over a large area of the south of England. A number emanated from Mitcham Common in 1972 and in 1973 (obtained by Mr B. Skinner) while others were beaten from sloe at Enfield. This indicated that the insect (well-known in Europe) must have always been with us, although it has been confused with the common *C. rectangulata* L. (the green pug). A sixth newcomer to the Area for the biennial period has recently come to light in the literature with the arrival of **Eupithecia phoeniceata** Rambur (the black-streaked pug) in Kent. A specimen of this insect taken in late August 1965 at Orpington by Mr I. A. Watkinson has only recently been identified whilst another example was taken also in this locality by Dr Sokoloff on 6 September 1973. This little moth, whose larval pabulum is *Cupressus macrocarpa*, seems to have spread rapidly over the south of England since a friend and myself took the original British specimen near Penzance in September 1959. The tiny moth *Sterrha vulpinaria* H.-S. (the least carpet) has also been extending its range; once almost confined to the Kent marshes it is now prevalent in many parts of Essex and Surrey. That delightful little migrant *Rhodometra sacraria* L. (the vestal) was once again in the south and west of England in September 1973, and at least one came into the Area at Thorpe, Surrey, taken by Mr P. Baker.

The pest *Euproctis chrysorrhoaea* L. (the brown-tail) appeared in some numbers at Hornchurch, Essex, and it is hoped it will not be penetrating the metropolis in vast hordes as it did in the 18th century. It was almost eliminated from the Benfleet district by spraying in the early 1950s.

Melanism has always been a special feature of the London Area and there is evidence that it is steadily increasing in a number of species of moths. It is therefore of special interest that Mr Peter Baker took the fifth example of ab. *nigra* Cockayne of *Catocala nupta* L. (the red under-wing). He found it at rest on a wall where he works at Hayes, Middlesex, and says the species is abundant there. In this spectacular variety the forewings are completely black instead of pale grey. His date of capture of this fine specimen was 29 August 1973. Also as late as 20 December of that year he took at his home near Thorpe, Surrey, a completely black specimen of *Erannis defoliaria* L. (the mottled umber), a new regional record for this melanic form which is fairly prevalent in Epping Forest. But the most remarkable melanic for the Area was a specimen of *Scotogramma trifolii* Hufn. (the small nutmeg), with its forewings entirely black, which would seem to be an undescribed form. It was taken in the summer of 1973 by Prof. J. V. Dacie at his home near Wimbledon Common.

Turning to the records for the respective vice-county regions, as before an asterisk (*) indicates a species not previously reported for the region under review.

Starting with INNER LONDON, apart from the Camberwell beauty taken by Mr Timothy Ruck in Regent's Park in July 1973, the only other butterfly of note was *Heodes phlaeas* L. (the small copper) observed sunning itself on a shop window in the City by Mr J. A. C. Greenwood in September 1973.

As already mentioned, the light-trap run in the garden of Buckingham Palace, for the fourteenth year in succession, has once more produced some unexpected species, though few are actual newcomers. The most unusual visitor in 1973 was *Philereme transversata* Hufn. (the dark scallop)*, a buckthorn feeder like its near relative *P. vetulata* Schiff. (the brown scallop), also taken in the Palace grounds in 1965. The foodplant is a most unlikely one to occur in the middle of the metropolis. There were again records in 1972 of *Hadena conspersa* Schiff. (the marbled coronet), mainly a denizen of the chalk downs, *Caradrina ambigua* Schiff. (Vine's rustic), a partial migrant, as well as *Lygephila pastinum* Treits. (the blackneck), a pasture species feeding on vetch, while *Apamea infesta* Ochs. (the large nutmeg), *Cosmia affinis* L. (the lesser-spotted pinion), and *Unca triplasia* L. (the dark spectacle) are none too common in the Area, let alone in the centre of London. Among the geometers, mainly noted in 1973, was *Scopula promutata* Guénée (the mullein wave), normally a rocky coast insect, while *Hydriomena caerulata* F. (the May highflier), feeds exclusively on alder, another uncommon tree for central London. Both *Eupithecia arceuthata* Freyer (the cypress pug), and *E. fraxinata* Crewe (the ash pug) have seldom been seen in Inner London and *E. nanata* Hübn. (the narrow-winged pug), a heather feeder, has reappeared in the Palace garden, as also have *Euphyia unangulata* Haworth (the sharp-angled carpet) and *Deuternomos fuscantaria* Steph. (the dusky thorn), both inhabitants chiefly of outer suburban areas. The total number of species of the macrolepidoptera recorded from the garden of the Palace by the end of 1973 just exceeds 200, including nine butterflies, among which the speckled wood was again noted in the summer of 1972.

For MIDDLESEX (v.c. 21) by far the most outstanding capture for many years was *Actebia fennica* Tausch. (Eversman's rustic)* taken in a light-trap at Shepperton in August 1972 by young Mr Lance Durden. Already referred to as being only the second British record of this noctuid moth, it is a denizen of northern Europe and Canada from the arctic to Ontario. Its means of arrival in this country is indeed problematical, whether a genuine migrant or brought in by aeroplane.

Enfield in the north-east of the vice-county produced a fine example of *Acherontia atropos* L. (the death's head hawk) in September 1973 taken by Mrs I. J. Gray, and also the larvae of the new little pug *Eupithecia chloerata* Mabille*, both already mentioned. The latter species was obtained by the Rev. David Agassiz who also reports a specimen of *Spaelotis ravida* Schiff. (the stout dart) in his Enfield garden in 1973 with two others taken by a neighbour, Mr R. Dyke. This fine noctuid is an uncommon visitor to the Area and is a partial migrant.

At the western end of Middlesex Mr Eric Classey reports the capture of *Lithophane semibrunnea* Haworth (the tawny pinion) taken after hibernation at Hampton on 21 April 1972. This is never a numerous insect in any part of its range in southern England. It is indeed somewhat remarkable that he should tave taken another specimen of this scarce species in his trap at Hampton just a year later on 13 April 1973, together with other hibernators such as *Eupsilia transversa* Hufn. (the satellite) and *Conistra vaccinii* L. (the chestnut). Mr Classey bemoans the growing scarcity of some of the Sphingidae in that part of Middlesex owing to building encroachment, though *Sphinx ligustri* L. (the privet hawk) and *Deilephila porcellus* L. have reappeared after several years of scarcity (*The Entomologist's Gazette* **23:** 258, 268; **24:** 212). He also had great numbers of the latter insect at his light trap in Bushy Park during 1973, as already mentioned.

During 1973 Mr Barry Goater collected frequently on the Wall Hall Estate near Watford where he obtained some very interesting insects, among which was *Hepialus fusconebulosa* Deg. (the map-winged swift), quite common in June. Earlier at the end of May he had taken *Cucullia chamomillae* Schiff. (the chamomile shark), together with the pugs *Eupithecia lariciata* Freyer (the larch pug), and *E. tantillaria* Boisd. (the dwarf pug). The melanic form *nigrofulvata* of *Semiothisa liturata* Clerck (the tawny barred-angle) was fairly numerous there in June 1973 as were also *Perizoma affinitatum* Stephens (the large rivulet) and *P. flavofasciata* Thunb. (the sandy carpet), both with larvae feeding on the red campion. Mr Goater also found at that period a number of borings in *Salix* stems near Stanmore made by the large larvae of *Sphecia bembeciformis* Hübn. (the osier hornet clearwing); these produced a fine series of these hornet-like moths in July.

HERTS. (v.c. 20) can in many ways take pride of place among the vice-counties with the discovery at Broxbourne in October 1971 of the tiny noctuid moth *Schrankia intermedialis* Reid*, new to science (see above). It can fairly be said this must be the first time any such species among the macrolepidoptera has been found in the London Area. Of hardly less importance was the record of the first *Lithophane leautieri* Boisd. (Blair's pinion)* for the Area which found its way into Mr R. I. Lorimer's light-trap at Totteridge on 1 November 1972. Other species of note observed in this trap in 1972 included a female *Rhyacia simulans* Hufn. on 2 October, only the fourth for the Area and the second for Herts. *Spaelotis ravida* Schiff. (the stout dart) appeared on 17 September and *Aporophyla nigra* Haworth (the black rustic) later that month, a scarce insect in this part of the Area. *Hadena compta* Schiff. (the varied coronet) reappeared in midsummer with a large number of *Apatele aceris* L. (the sycamore), many of which were melanic. In 1973, as mentioned above, Mr Lorimer had the surprise to take *Eumichtis lichenea* Hübn. (the feathered ranunculus)* at Totteridge on 8 October. This insect seems to be finding its way inland from its normal coastal habitats. Another unlikely insect in that part of the Area was *Eilema complana* L. (the scarce footman), usually associated with heathland and sandhills, while *Apamea sublustris* Esp. (the reddish light arches) was another unexpected visitor, mainly an inhabitant of downland. Other trap records for 1973 comprised *Gastropacha quercifolia* L. (the lappet), *Sphinx ligustri* L. (the privet hawk), apparently rare in that region. Also many insects of *Harpyia furcula* Clerck (the sallow kitten), as well as *Nycteola revayana* Scop. (the large marbled tortrix). Geometers seldom seen before at Totteridge included *Hemistola chrysoprasaria* Esp. (the small emerald), a *Clematis* feeder, *Lygdia adustata* Schiff. (the scorched carpet), a spindle feeder, *Thera juniperata* L. (the juniper carpet), possibly from cultivated juniper, while a melanic *Gonodontis bidentata* Clerck (scalloped hazel) completes the most interesting records from Mr Lorimer.

Mr Barry Goater has once more produced a valuable list of observations mainly from Bushey during 1973. He mentions that *Aporophyla lutulenta* Schiff. (the deep-brown dart) was especially numerous in the autumn, whereas *Hadena conspersa* Schiff. (the marbled coronet) was only the second record for this locality. A completely black male *Lycia hirtaria* Clerck (the brindled beauty) appeared at Bushey on 1 May 1972. This form is still quite a rarity in the Area. The little *Aegeria tipuliformis* Clerck (the currant clearwing) was quite common in that vicinity in the larval state in both years, and a good many imagines bred out. Two less common thorns turned up in 1973: *Selenia lunaria* Schiff. (the lunar thorn) in June and *Apeira syringaria* L. (the lilac beauty) in July, while *Zygaena lonicerae transferens* Verity (the narrow-winged five-spot burnet) was locally common in the district.

Finally reference has already been made to the specimen of *Leucania unipuncta* Haworth (the white-speck wainscot)* taken by Mr John d'Arcy at Broxbourne in October 1971: only the third record of this migrant for the Area.

As usual NORTH ESSEX (v.c. 19) seems to be the Cinderella of the vice-counties, with only a small portion encroaching into the Society's Area. There are no records for the two years under review.

For its sister region SOUTH ESSEX (v.c. 18), there is plenty to report. Under the title "Unusual Habitat" Mr W. Coster published in the *Bulletin of the Amateur Entomologists' Society* **301** (November 1973) a most comprehensive list of moths noted at a light trap run between July 1971 and August 1972 on a waste piece of ground at Newham. Among 130 species recorded during this period were many specimens of *Leucoma salicis* L. (the satin moth), and *Euproctis chrysorrhaea* L. (the brown-tail) which seems to be getting more common nearer London. *Cucullia asteris* Schiff. (the starwort shark) is an unlikely moth to be found so near the metropolis as it is normally an inhabitant of the marshes and woods along the Thames. Two other noctuids *Eremobia ochroleuca* Schiff. (the dusky sallow) and *Pyrrhia umbra* Hufn. (the bordered sallow) are usually denizens of downland, while the occurrence in this area of *Cirrhia ocellaris* Borkh. (the pale lemon sallow)*, a very local insect on poplar, is noteworthy. *Rhizedra lutosa* Hübn. (the large wainscot), a veritable marshland species of the autumn months, was yet another unexpected insect for this region. That little geometer *Sterrha vulpinaria* H.-S. (the least carpet) seems to be making its way steadily nearer the centre of London. Several insects of *Spaelotis ravida* Schiff. (the stout dart) came to the trap both in 1971 and 1972.

Mr Coster also enumerates 140 species he recorded at his light-trap run at his new home at Hornchurch during 1973, a very similar series to that from Newham with half a dozen *Spaelotis ravida* (the stout dart) and 124 brown-tails. There was a single *Hadena compta* Schiff. (the varied coronet), a new regional record for this coloniser which is ever spreading its range. Among species mainly associated with marshland were further specimens of *Cucullia asteris* Schiff. (the starwort shark), and also *Hadena suasa* Schiff. (the dog's tooth). *Smerinthus tiliae* L. (the lime hawk) provided thirteen examples and there were over 200 specimens of *Malacosoma neustria* L. (the lackey). The commonest geometer was *Sterrha vulpinaria* (the least carpet), with 75 examples, which seems to be having a remarkable increase in its range. An uncommon insect for this region was *Semiothisa notata* L. (the peacock moth), essentially an inhabitant of birch country.

Mr K. W. Grimwood has once more sent in an interesting list of records and captures from the fringe of the eastern part of the Area at Ingrave near Brentwood. In 1972 he had the good fortune to take a specimen of *Acontia luctuosa* Schiff. (the four spot)*, a day-flying noctuid which has become very scarce of recent years. *Arctia villica* L. (the cream-spot tiger) reappeared, none too common in this part of the country, as also is *Leucania obsoleta* Hübn. (the obscure wainscot), a true reed-bed inhabitant. Among newcomers to Mr Grimwood's trap in 1973 were *Rheumaptera cervinalis* Scop. (the scarce tissue), a *Berberis* feeder, *Cybosia mesomella* L. (the four-dotted footman), an insect of heathland, and *Apatele alni* L. (the alder moth*, seldom seen in Essex. Other species of note which reappeared in the two years were *Deilephila porcellus* L. (the small elephant), *Stauropus fagi* L. (the lobster), *Polia nitens* Haworth (the pale shining brown), *Nonagria sparganii* Esp. (Webb's wainscot), *Cucullia asteris* (the starwort shark), and the small geometers *Sterrha vulpinaria* (the least carpet) and *Bapta distinctata* H.-S. (the sloe carpet). *Hadena compta* (the varied coronet) is now abundant in this region. As regards the butterflies, Mr Grimwood found *Strymonidia w-album* Knoch (the white-letter hairstreak) to be fairly common in 1973 and says that *Pararge aegeria* L. (the speckled wood) has reappeared in the district and is becoming steadily more numerous, since it disappeared in the early part of the century from this part of England. *Celastrina argiolus* L. (the holly blue) was abundant in 1972, but virtually absent in 1973, as was also *Polygonia c-album* L. (the comma).

For WEST KENT (v.c. 16) the rather fewer records than usual comprise some very choice species. Among the butterflies the capture of a specimen of *Nymphalis antiopa* L. (the Camberwell beauty) at the Keston end of Hayes Common on 31 July 1973 is indeed a most important record. The fortunate observer was a young collector, Andrew Holmes, who spotted it on a *Buddleja* bush and showed it to Mr D. Burrows who reported it in the *Entomologist's Record* 85: 269. This is the second example of this grand butterfly seen in the Area in 1973 and coincides nearly in date with the other one taken in Regent's Park on 29 July.

Among the moths for West Kent the most outstanding record in the two years was the definite sighting by Mr O'Keeffe in his light-trap at Bexley of *Apamea lateritia* Hufn. (the scarce brindle)* the very night that Mr Skinner took another at West Norwood on 17 July 1972. Yet these were the second and third specimens of this moth for the British Isles. Another notable capture by Mr O'Keeffe on 31 July 1973 was a large female of *Eurois occulta* L. (the great brocade), a rare visitor to the Area, and certainly of migrant origin for this part of England. He also took in May 1973 at Bexley *Hadena conspersa* Schiff. (the marbled coronet), an unusual insect for such a built-up region, since it mostly inhabits the outer downlands of Kent.

A new arrival in West Kent has been *Eupithecia phoeniceata* Ramb. (the black-streaked pug)* already referred to. Two specimens have been recorded, both taken at Orpington, one in late August 1965 by Dr I. Watkinson who did not confirm its identity till 1973, when Dr Sokoloff took another example on 6 September of that year. This is a Mediterranean species which found its way to the Channel Islands during the war, and to Cornwall where it was first recorded in September 1959.

From Lee Mr Cyril Bruce reports several interesting species for the period. These include eight moths which he has not seen before in his 21 years in the district. The species cited are *Cirrhia ocellaris* Borkh. (the pale lemon sallow), a poplar feeder, which seems to be spreading in that part of Kent, as is *Cirrhia gilvago* Schiff. (the dusky lemon sallow), an elm feeder. Both these insects were observed in the autumn of 1972. In the summer of 1973 he had *Lygephila pastinum* Treits (the blackneck) with the local geometer *Euphyia cuculata* Hübn. (the royal mantle), while in the autumn he noted *Conistra ligula* Esp. (the dark chestnut), *Agrochola macilenta* Hübn. (the yellow-line quaker), and *Plusia festucae* L. (the gold-spot plusia). Another late species he took again was *Aporophyla nigra* Haworth (the black rustic) which is rare in Kent. He was also revisited by *Hadena compta* Schiff. (the varied coronet) in June 1973.

Near Downe Mr Chalmers-Hunt saw *Abraxas sylvata* Scop. (the clouded magpie) in July 1973, a local insect among wych-elm.

From the neighbourhood of Dartford Mr B. K. West has several interesting species to report for the two years. His garden backs on to Joyden's Wood which must have been the source of at least a dozen specimens of *Hapalotis venustula* Hübn. (the rosy marbled) in July 1972 and again in June 1973. This would seem a new location for this little noctuid which appears to be spreading its range rapidly in this part of England. *Parascotia fuliginaria* L. (the waved black) also reappeared in both years. This is likewise a newcomer to this locality as apparently is *Hadena compta* Schiff. (the varied coronet) and *Stauropus fagi* L. (the lobster). Other insects of note included *Polia nitens* Haworth (the pale shining brown), *Graphiphora augur* Fab. (the double dart), which has returned after several years absence, *Apamea unanimis* Hübn. (the lesser clouded brindle), *Zenobia subtusa* Schiff. (the olive kidney), *Cosmia diffinis* L. (the white-spotted pinion), and the geometers *Philereme transversata* Hufn. (the dark scallop), and *Cosymbia linearia* Hübn. (the clay triple lines), far from its usual habitat on the chalk. Mr West found larvae of *Cucullia asteris* Schiff. (the starwort shark) feeding on Michaelmas-daisy in his garden.

As usual there is a lot to write about for SURREY (v.c. 17) where butterflies were in profusion on the downs, in particular *Lysandra coridon* Poda (the chalk-hill blue), which was plentiful on Box Hill and in the Banstead and Epsom areas in late July, as the wonderful summer of 1973 had brought it out several weeks earlier than its normal date of early August. The sighting of over fifty insects of *Thecla quercus* L. (the purple hairstreak) in one morning on Wimbledon Common in late July 1973 by Mr Pink was indeed quite an event, though apparently it was plentiful in 1970 as well.

Surrey has provided many interesting records for moths especially among the Sphingidae (hawks), with *Acherontia atropos* L. (the death's head) at Warlingham in mid-September 1973 taken by Mr Betteridge, and the rarity *Celerio euphorbiae* L. (the spurge hawk) taken at light at Selsdon by Mr E. Wild in late May 1973. Also at Selsdon in 1972 he took three specimens of *Xanthorhoe fluctuata* L. (the garden carpet) of the rare form *costovata* with most of the crossbands on the forewings absent. Other species new to his trap in 1972 were *Herminia barbalis* Clerck (the common fan-foot), *Aporophyla lutulenta* Schiff. (the deep-brown rustic), and *Sterrha vulpinaria* H.-S. (the least carpet).

The amazing capture of *Apamea lateritia* Hufn. (the scarce brindle)* by Mr Bernard Skinner in West Norwood on 17 July 1972 has already been reported. In May 1973 he beat out on Mitcham Common from sloe blossom no less than sixteen full-fed larvae of the new *Chloroclystis chloerata* Mab. (the sloe pug)* which were successfully bred out in June, producing some melanic forms, not previously noted in this species. Another newcomer, already mentioned, was the capture of a *Lithophane leautieri* Boisd. (Blair's pinion)* at Oxted on 5 November 1972 by Mr M. Cock. Yet a further new species for Surrey was a specimen of *Eumichtis lichenea* Hübn. (the feathered ranunculus)* taken at Addiscombe on 26 October 1969 which has only recently been recorded. It is mainly a coastal insect which has seldom been seen far inland.

According to the list from the Croydon Natural History Society, 1972 provided many interesting records. In Ashtead Woods in May a full-fed larva of *Dicycla oo* L. (the heart moth) was beaten from oak, while in July *Apoda avellana* L. (the festoon) and *Parascotia fuliginaria* L. (the waved black) were taken there; this last species also turned up at Limpsfield Chart, a new locality for this little moth. At Selsdon Mr E. Wild took *Lygris prunata* L. (the phoenix), an insect which has become quite scarce of recent years. *Eupithecia denotata* Hübn. (the campanula pug) appeared at Caterham in July and at Mitcham Common in September Mr B. Skinner found *Cirrhia ocellaris* Borkh. (the pale lemon sallow) sitting about in numbers on grasses below poplar trees, its larval food plant. A specimen of *Laphigma exigua* Hübn. (the small mottled willow) was taken at North Cheam, one of the few migrants in 1972, while at Kenley in July Mr D. Martinggell caught on the wing a specimen of *Sesia apiformis* Clerck (the poplar hornet clearwing), a moth seldom seen flying by day. In February 1973 I found on a window at Juniper Hall near Box Hill a hibernated female of *Chlorclysta miata* L. (the autumn green carpet) for which there are only two other records for Surrey.

As in previous years Professor J. V. Dacie has had some worthwhile captures at his home on the borders of Wimbledon Common. During 1973 a number of species, of which he had seen only very few examples previously, reappeared. Among these were *Hadena lepida* Esp. (the tawny shears), *Leucania pudorina* Schiff. (the striped wainscot), *Euxoa tritici* L. (the white-line dart), *Parastichtis suspecta* Hübn. (the suspected), *Cosmia diffinis* L. (the white-spotted pinion), and *Zenobia subtusa* Schiff. (the olive kidney), the last two being noctuids which are not often seen so near the centre of the metropolis. Among the geometers were *Sterrha inornata* Haworth (the plain wave), *Eupithecia haworthiata* Doubleday (Haworth's pug), *E. dodoneata* Guén (the oak-tree pug) and *E. arceuthata* Freyer (the cypress pug), but his most interesting records were among melanic forms, especially of *Cryphia perla* Schiff. (the marbled beauty), and of *Alcis repandata* L. (the mottled beauty). A remarkable insect was an example with completely black forewings of the noctuid *Scotogramma trifolii* Hufn. (the small nutmeg) which seems to be a new extreme form of this type of melanism. *Polia tincta* Brahm. (the silvery arches) in 1973, was a new addition for his Wimbledon list.

As before Mr Peter Baker who lives near Thorpe just on the boundary of the Area has some further valuable records for the biennial period. His most outstanding catch for 1973 was the female of *Hyles gallii* Rott. (the bedstraw hawk) taken in his trap on 18 July and apparently the only one to penetrate inside the Area in this probable record year for this fine moth in Britain. Another newcomer to this part of Surrey was *Hadena compta* Schiff. (the varied coronet) which seems to be becoming quite a common insect all over the Area. The arrival of the little *Rhodometra sacraria* L. (the vestal) on 9 September 1973 was another visitor of only very sporadic occurrence to London. Other species he had not noted before included *Dasychira fascelina* L. (the dark tussock) in 1972, and *Comacla senex* Hübn. (the round-winged muslin) in 1973, a marsh insect, as was also *Nonagria geminipuncta* Haworth (the twin-spotted wainscot), all uncommon in the Area. Other less frequent geometers new to this district included *Cosymbia linearia* Hübn. (the clay triple-lines), a beech feeder, *Philereme transversata* Hufn. (the dark scallop), a buckthorn feeder, and *Chloroclysta miata* L. (the autumn green carpet). He also took *Oporinia christyi* Prout (Christy's autumnal carpet) in November 1973 and on 20 December a remarkable all-black example of *Erannis defoliaria* L. (the mottled umber), more melanic than those found regularly in Epping Forest. During the period he had visits again from *Leucoma salicis* L. (the satin moth), *Spaelotis ravida* Schiff. (the stout dart), and *Horisme vitalbata* Schiff. (the small waved umber), while *Dysstroma citrata* L. (the dark marbled carpet) in 1973 was yet another scarce species for this part of Surrey. The little noctuid *Hapalotis venustula* Hübn. (the rosy marbled) reappeared in both years as also did *Semiothisa alternaria* Hübn. (the sharp-angled peacock), a very infrequent insect in the Area. Among other less common insects were *Agrotis vestigialis* Rott. (the archer's dart), *Eilema deplana* Esp. (the buff footman), and *Eupithecia valerianata* Hübn. (the valerian pug), with only one other record for the Area, which was also in Surrey. Other insects taken at Thorpe included *Apatele alni* L. (the alder moth) and *Mesoleuca albicillata* L. (the beautiful carpet). *Earias clorana* L. (the cream-bordered green pea) and *Gnophos obscurata* Schiff. (the annulet) were other uncommon insects recorded for the district. The autumn of 1973 saw the moderate abundance near Thorpe of *Dasycampa rubiginea* Schiff. (the dotted chestnut). An extraordinary insect taken by Mr Baker in the summer of 1973 was *Biston betularia* L. (the peppered moth), having three wings black and the right forewing almost white.

Finally for BUCKS (v.c. 24) Sir Eric Ansorge reports that during 1973 he had another visit at Chalfont St Peter from *Anaplectoides prasina* Schiff. (the green arches) and from *Panolis flammea* Schiff. (the pine beauty), always rare in this part of the county owing to lack of conifers. Therefore it is also surprising that yet another pine-feeder *Thera firmata* Hübn. (the pine carpet) was noted there that year. Nearby at Little Chalfont Mr Paul Selden took that ever-spreading *Hadena compta* Schiff. (the varied coronet)*.

In December 1972 there was published by the British Museum (Natural History), London, the most up-to-date list of the British lepidoptera based on that brought out in 1945 by Kloet and Hincks. I have therefore drawn up a table showing the number of species of macrolepidoptera found in each of the seven vice-county regions as well as in Inner London (Table 1).

TABLE 1. Number of macrolepidoptera recorded from Inner London (IL), the vice-counties in the London Area, the London Area as a whole, and the United Kingdom.

	IL	21	20	18	19	16	17	24	London Area	U.K. (1973)
Butterflies	25	49	47	51	25	53	54	31	59	78
Macro-moths	263	544	532	486	241	593	608	423	676	859
Totals:	288	593	579	537	266	646	662	454	735	937
Increase since 1967:	13	6	11	12	0	6	5	6	9	6

To summarise it will be seen that no less than nine new species have been added to the Area list since 1967 making a total of 735 species of macrolepidoptera out of 937 species recognised as valid for the United Kingdom up to the end of 1973. This makes an overall proportion of 78.4%, which is slightly higher than 78.0% which was the position at the end of 1971.

Book Review

A Key to the Adults of the British Trichoptera. By T. T. Macan. 151 pages, 5 plates, 63 text figs. Freshwater Biological Association, Ambleside. Scientific Publication **28.** 1973. £1.25.

Dr Macan's book is larger and deals with more species (193) than any previous issue and is excellent value for money. The key to the British caddis-flies, which is in a short preliminary and five long major parts, is accompanied by hundreds of line drawings of genitalia, wing patterns, etc., by C. Joan Worthington. These are good and and based entirely on fresh or spirit-preserved material, rather than on dried, pinned specimens. A character, the sculpture pattern or "cushions" of the meso-nota, used for the first time in a key to the British caddis-flies, helps to sort the species into seven major groups. In previous numbers of the series the authors of species names have been given, either in the body of the key or in a checklist. Unfortunately neither example is followed in this book, and one has to refer to D. E. Kimmins' list in a separate publication. It is hoped that this omission will be rectified in future editions.

A. E. LE GROS

Mammals in the London Area 1972 - 1973

by K. A. J. Gold

As a recorder of barely two months standing, and one used to seeing long lists of observers in previous mammal reports, it came as quite a shock to find that at the end of 1972 there were only 14 mammal observers in the whole of the London Area. Compare this figure with 99 in 1965, 81 in 1966 and 1967 and 92 as recently as 1970. It would have been pleasant to have opened this paper with the statement that "the number of mammal records sent in each year continues to increase", as did Burton (1966). This was reiterated by Beames (1968) when he wrote "the information accumulating in the Society's files about the mammals in the London Area increases from year to year". Regrettably neither statement is appropriate now.

The massive drop in observers has brought with it an equal decline in the number of mammal records. It is not sensible to suppose that in the course of only three years, London's mammal population has nose-dived to the level indicated in the September 1973 Newsletter (based on the 1972 records). The decline in observations reflects merely the dwindling number of people sending information to the mammal recorder, not a lack of original data. The reasons for the decline in interest in recording London's mammal population are not clear, but it is hoped that by returning to the format used in mammal reports until the end of the sixties (Beames 1969), members will be able to appreciate the seriousness of the situation. In future reports it is hoped also to include some distribution maps to give a visual indication of the areas where special effort is required.

Mammal records can be of many types and any observation, however casual, is of use. It is not sightings only which constitute a record – any of the following types of observation are just as valid and will be gratefully received by the Recorder:

1. Identification of small mammal skulls and jaw bones, from owl pellets and from old discarded bottles (An appendix to this paper outlines a simple key to the identification of such remains).
2. Foot/hoof prints in mud and snow.
3. Droppings of rabbit, deer, etc.
4. Fresh molehills.
5. Scent, e.g. fox.
6. Call, e.g. fox, badger, squirrel, mouse, shrew.

Send your records on a record sheet (available from the Recorder) indicating:

a. Location of observation, including the county.
b. Date.
c. Nature of the record, e.g. footprint, and any other notes.
d. Habitat.
e. Grid reference (where known).
f. Name of observer.

To enable the Recorder to compile a mammal report on an annual basis it would be of great assistance if observers would submit their records for the preceding year by not later than 10 January. Records after this date are, of course, welcome, but their inclusion in the next report cannot be guaranteed.

At the time of writing there are four people working on mammals: two on badgers one of whom is also looking at foxes, and two people involved in small mammal trapping. It is hoped that at least one of these will contribute to *The London Naturalist* in due course.

Systematic List

The checklist numbers are from Corbet (1969).

INSECTIVORA

1. HEDGEHOG *Erinaceus europaeus* L.

Most records refer to road casualties. The number of records is greater for 1973 than for 1972, except for Herts.

ESSEX. Barkingside (up to two in gardens April-Sept. 1973); Chigwell; Epping; Hornchurch; Seven Kings (dead in garden); Theydon Bois.

HERTS. Brickendon; Hertford; Hertingfordbury; Potters Bar.

MIDDX. Recorded only in Enfield in 1972, but in 1973 at Bush Hill Park (Enfield), Finsbury Park, Harrow, Kenton, Tottenham, Wembley.

SURREY. Beulah Hill (Croydon) (both years); Esher; Hersham; Purley; Southfields (Wandsworth); Walton-on-Thames; Wimbledon.

2. MOLE *Talpa europaea* L.

Recorded only in Essex in 1972, a little more widespread in 1973.

ESSEX. Barkingside; Corbet's Tey (Upminster); Lambourne End.

MIDDX. Trent Park (Enfield).

SURREY. Bookham Common.

3. COMMON SHREW *Sorex araneus* L.

Two records only for each year.

MIDDX. Maple Cross; Old Ponders End Sewage Farm (Enfield).

SURREY. Esher; Kew Gardens.

4. PYGMY SHREW *Sorex minutus* L.

No records for 1972. The 1973 records are of dead animals.

SURREY. Ashtead Common; Bookham Common.

CHIROPTERA

No records of identified bats have been received in the last two years. Most references in observers' notes are of bats in flight, and their identification is therefore notoriously difficult. Many records appear from their descriptions to be of pipistrelles (*Pipistrellus pipistrellus* (Schreber)) and noctules (*Nyctalus noctula* (Schreber)). Any sightings, identified or not, will be gratefully received.

CARNIVORA

24. Fox *Vulpes vulpes* (L.)

Quite a well recorded species, the number of records increasing in 1973.

Essex. Chigwell Row; Fairlop; North Ockenden; Orsett; Thorndon Park.

Herts. Broxbourne Woods; Hoddesdon.

Kent. All records refer to 1973. Dulwich; Petts Wood.

Middx. Brent Reservoir; Enfield; Finchley; Finsbury Park; Harrow; Northwood; Ruislip.

Surrey. Ashtead; Barnes; Beulah Hill (Croydon); Bookham Common; Coulsdon; Esher; Limpsfield; Purley; Wandsworth; Wimbledon Common.

27. Stoat *Mustela erminea* L.

Herts. Eastwick, 1972.

28. Weasel *Mustela nivalis* L.

Bucks. Iver.

Herts. Brickendon Green; Essendon.

Middx. Old Ponders End Sewage Farm (Enfield).

31. Badger *Meles meles* (L.)

A single sighting in 1972, but an increase in 1973 with some setts in Surrey.

Kent. Sundridge (Bromley).

Middx. Northwood.

Surrey. Croydon; Merton; Wimbledon Common; Woldingham.

ARTIODACTYLA

Records of deer have become scarce, there being only one for the last three years.

46/47. Muntjac *Muntiacus* sp.

Herts. Broxbourne (being chased by a dog).

LAGOMORPHA

53. Brown hare *Lepus capensis* L.

In general the numbers of records are down on previous years.

Essex. Little Heath; Rainham Marsh; Waltham Abbey.

Herts. Datchet Reservoir; Gilston.

Surrey. Bookham Common; Kempton Park.

55. Rabbit *Oryctolagus cuniculus* (L.)

The most recorded of all the mammals.

Essex. Aveley; Barkingside (up to eight March-November); Bulphan (Thurrock); Chigwell Row; Clayhall (Redbridge); Curtismill Green; Debden; Epping Forest; Fairlop School playing-field (up to 14 per day January-May, including one melanic); Fairlop gravel-pit; Hainault Forest; High Beech; Hornchurch; Lambourne End; Navestock; Stapleford Abbots; Stifford; Walthamstow Marsh; Wanstead Park.

HERTS. Bayford; Berkhamsted; Broxbourne; Cuffley; Eastwick; Essendon; Hatfield; Hunsdon; Letty Green; Panshanger; Stanstead Abbots.

INNER LONDON. Kensington Gardens.

KENT. Dartford; Green Street Green; Stone.

MIDDX. Old Ponders End Sewage Farm (Enfield).

SURREY. Bookham Common; Mitcham Common; Wimbledon Common (numbers rising after reduction in autumn 1970, due to myxomatosis); Woldingham.

RODENTIA

57. GREY SQUIRREL *Sciurus carolinensis* Gmelin

ESSEX. Chigwell; Corbet's Tey (Upminster); Curtismill Green; Epping Forrest; Hainault Forest; High Beech; Loughton; Thorndon Park; Wanstead Park.

HERTS. Northaw.

INNER LONDON. Hyde Park; Kensington Gardens; Newgate St EC1 City); Regent's Park.

MIDDX. Bourne Hill (Enfield); Finsbury Park; Grange Park; Harrow; Northwood.

SURREY. Ashtead Park; Beddington; Bookham Common; Elmer's End (Croydon); Esher; Oxted; Selsdon; Southfields (Wandsworth).

61. HARVEST-MOUSE *Micromys minutus* (Pallas)

MIDDX. Northwood, 1973.

62. WOOD-MOUSE *Apodemus sylvaticus* (L.)

All records refer to 1973.

ESSEX. Hainault Forest.

MIDDX. Kenton; Ruislip.

SURREY. Bookham Common; Esher; Richmond Park.

67. BANK-VOLE *Clethrionomys glareolus* (Schreber)

SURREY. Bookham Common, 1973; Kew Bridge (dropped by kestrel), 1973.

68. WATER-VOLE *Arvicola terrestris* (L.)

ESSEX. Ongar.

HERTS. River Rib.

MIDDX. Old Ponders End Sewage Farm (Enfield); Walthamstow Reservoirs.

SURREY. Esher.

69. FIELD-VOLE *Microtus agrestis* (L.)

ESSEX. Luxborough (two swimming) (Chigwell).

MIDDX. Barn Hill (Brent); Highgate Woods.

SURREY. Bookham Common; Esher; Richmond Park.

My thanks go to the following people who have contributed to the records contained in this report: R. C. Barker, G. Beven, F. R. Blatchley, D. A. Boyd, Miss D. M. Brooker, J. D. Daffron, G. Davies, B. Fletcher, D. French, O. B. J. French, Mrs L. E. Gold, Mrs E. F. Greenwood, P. R. Greenwood, Mrs B. Hardwidge, E. C. G. Hardwidge, Mrs M. Harrison, Miss S. Hyder, I. G. Johnson, Miss M. E. Kennedy, R. H. Kettle, W. Killpack, A. E. Le Gros, D. Martin, *Mitcham News*, Mrs H. Morris, A. F. Mussellwhite, Mrs B. S. Mussellwhite, Sir F. Pedlar, P. Rigby, Sister J. Rutledge, C. W. R. Storey, G. Taylor, W. G. Teagle, Mrs A. Warren, Miss D. Edwards, Miss P. Viola, and J. W. Yalden. My apologies to any members inadvertently omitted. I should like to thank my wife for her assistance during the year, and for reading the manuscript and making helpful criticisms and suggestions.

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APPENDIX

Key to the Skulls and Lower Jaws of Some Small Mammals Found in Discarded Bottles and Owl Pellets.

This key is based on a combination of two such keys in the possession of the Recorder, neither of which has an author's signature so that credit cannot, unfortunately, be given.

1a.	Insicors not separated by gap (diastema) from cheek teeth	(Insectivora) 2
1b.	Incisors separated by gap from cheek teeth	(Rodentia) 5
2a.	Lower jaw, including incisors, longer than 20 mm	Mole
2b.	Lower jaw less than 20 mm	3
3a.	Lower jaw c. 14 mm long, including incisor; incisor without notches	Water-shrew
3b.	Lower jaw less than 14 mm	4
4a.	Lower jaw c. 12 mm	Common shrew
4b.	Lower jaw c. 9 mm	Pygmy shrew
5a.	Teeth with tubercles on grinding surfaces	6
5b.	Teeth with zig-zag pattern on grinding surfaces	8
6a.	Lower jaw (excluding incisor) less than 10 mm	Harvest-mouse
6b.	Lower jaw greater than 10 mm but less than 15 mm ...	7
7a.	Largest upper cheek tooth with 4 roots ...	Wood-mouse
7b.	Largest upper cheek tooth with 3 roots ...	House-mouse
8a.	Cheek teeth with transverse ridges on surfaces	Dormouse
8b.	Cheek teeth with triangles on surfaces	9
9a.	Cheek teeth with roots	Bank-vole
9b.	Cheek teeth without roots	Field-vole

Obituaries

STANLEY THOMAS JERMYN, 1909-1973

The sudden death of Stan Jermyn on 23 September 1973 has deprived the Society of a long-standing member widely known in the fields of botany and conservation.

He was born at Benfleet on 1 June 1909 and will be remembered for the extremely well attended field meetings he led near his home at Leigh on Sea in the post war years, and for the lectures on wild flowers superbly illustrated with colour photographs in stereo by his brother, L. T. Jermyn, for which the audience had to wear special spectacles. His lectures on more erudite subjects were always characterised by some personal touch, such as the duplicated original key to the Umbelliferae which he handed out to all who attended. At this time (1947-1957) he was the energetic Honorary Secretary of the South Essex Natural History Society and the mainstay of their considerable botanical activities.

Stan moved to Brentwood in 1958, but in 1964 his job as Transport Manager for the Ardath Tobacco Company become redundant owing to a merger, and he was forced to retire at the age of 55. Thereafter nearly the whole of his time was devoted to natural history. In 1966, the year after a move to Felsted, he became General Secretary of the Essex Naturalists' Trust, of which he was also Treasurer. This opportunity provided full scope for excercising his tremendous energy, enthusiasm and organising ability. When he took over, the membership of the Trust was less than 1000; it was nearly 6000 at his death, the largest membership of any county or regional trust. The trust now has 33 reserves totalling about 1900 acres, and up to the end of 1972 some £20,000 had been raised, with further large amounts since in response to an appeal for £100,000. He represented Essex on the London Nature Conservation Committee. He was elected a Fellow of the Linnean Society of London in 1964.

Stan Jermyn's main publication will be the new and much needed *Flora of Essex*—the last appeared in 1862. On this he had been working for many years and at the time of his death the manuscript was virtually complete, and the first batch of proofs had been received from the printers. Dr K. J. Adams and Mrs Jermyn, aided by John Fielding, will see the *Flora* through the press, though there are still financial problems to be solved.

To his widow, Pamela, and his son, Richard, we extend our deepest sympathy. With the death of Stan, botany and conservation have suffered the loss of a most enthusiastic and energetic worker, and many of us a greatly respected friend.

J. E. LOUSLEY

CLEMENCE MARGARET ACLAND, 1889-1973

Clem Acland, as she was generally known, died on 10 March 1973. She came from a generation that believed that difficulties were made only to be overcome. Born in London in 1889 she moved at the age of four to the Banstead area, where she spent the rest of her life. She was interested in birds when very young and tales of her early truancies sounded more like boyish exploits than those of a girl of good family at the turn of the century. Her toughness stayed with her throughout her life, much of which was devoted to looking after first her parents and then her sister. She saw service in France during the First World War as a bacteriological assistant and later worked as a research assistant in South Wales until 1929. As a Guide Commissioner her facility for interesting young people in country life and natural history was invaluable. She was well known also in Banstead for her keen participation in social work. During the Second World War she was a full-time ambulance driver.

Clem started ringing birds under the Witherby scheme at the very outset as early as 1910, and she later achieved considerable success as a bird photographer, often in association with her great friends Col. H. Morrey Salmon and Arthur Brook. Handicapped quite early by a weak wrist and knee she still got ashore from small boats on places like Grassholm, where she took part in the first photographic census of the gannets as long ago as 1922. Her photographic work earned the much prized membership of the Zoological Photographic Society, and her travels took her to many countries in search of subjects, providing material for professional lectures on natural history.

When the LNHS Ornithological Section was planning *The Birds of the London Area since 1900*, Clem was invited to join the editorial committee, on which her knowledge of the environment from the very start of the period was of great help. She also worked very hard on abstracting old records from journals for the book, travelling up specially to the Zoo library for the purpose. Some twenty odd years later the Surrey Bird Club had equal cause to be grateful for these early memories when they were preparing *Birds in Surrey*.

When Clem had passed 70 she travelled with a friend in a motorised caravan through Africa on a six-month safari from which she returned with many excellent photographs. In 1966, when she was already 77, she spent part of the time in bed, after a bad accident, planning a trip to New Zealand. Though the accident left her in a wheel-chair, or moving painfully and with great difficulty on two sticks, she not only went but with the help of friends saw many of the unusual species.

Clem was a great raconteuse and to listen to her exploits under difficulties was a humbling experience. She regularly attended the periodical international ornithological conferences and she will be greatly missed, not only by the many people she helped and entertained but by ornithologists in many lands, who like her friends at home admired her indomitable spirit and kindliness.

R. C. Homes

JOSEPH HENRY GARFIELD PETERKEN, 1893-1973

Joseph Henry Garfield Peterken died on 13 September 1973 at the age of eighty. Mr Peterken was born on 24 March 1893 at Leyton, in which district he lived for many years until moving to Chalfont St Giles in Buckinghamshire. He was a chartered accountant by profession and his natural history interests included birds, bryophytes and lichens. With his wife he attended most field meetings of the British Bryological Society which he joined in 1939, and of the British Lichen Society of which he was a founder member from 1958.

Joining the London Natural History Society in 1937 he frequently attended their meetings, and being familiar with Epping Forest led several field excursions there. He was President from 1952-54 and his address "Habitats of the London Area" was printed in *The London Naturalist* **32** (1953). Following the publication of "A hand list of the plants of the London Area" by D. H. Kent & J. E. Lousley, he compiled from various sources a similar list for the bryophytes which was published in *The London Naturalist* **40** (1961). The Society is grateful for the committee meeting facilities he provided at his City office in the years before the redevelopment of Coleman Street.

E. C. Wallace

FREDERICK LEETHAM REYNOLDS

Nature conservation suffered a great loss when Freddie Reynolds, conservation officer for the Surrey Naturalists' Trust, died on 30 August 1973 following an operation.

He had worked for Hampshire, Sussex, and finally Surrey Naturalists' Trusts, and from the time he joined the London Nature Conservation Committee in 1971 his help and advice were always available. In the preparation and presentation of the naturalists' case at the Staines Moor Enquiry he worked long and hard with great enthusiasm. Without him the task might not have ended in success.

He was a fine naturalist with a special interest in the Orthoptera of Thursley Common on which he had written a paper. He loved and cared for this beautiful locality and it was an unforgettable experience when he conducted one over the area.

He was a charming and reliable friend, an indefatigable worker who died as he wished: quickly, without a long illness which would have fretted his energetic soul. The three Trusts for which he worked are setting up a memorial fund for the promotion of conservation and countryside interpretation by approved organisations or individuals within their areas.

L. M. P. Small

Statement of Affairs

1972				
	Premises and Equipment Fund (incorporating the Hindson and Castell bequests)			
	Balances at 1 November 1972			
26,403	Hindson bequest		27,110	
22,000	Castell bequest		22,093	
2,293	Premises fund		2,078	
–	Add: Received during current year		1,000	
983	Add: Interest for year		2,545	
51,679			54,826	
398	Less: Grant to general account		234	
51,281				54,592
	Life Composition Account			
240	Balance at 1 November 1972		200	
40	Less: transfer to general account		–	
200				200
	Ornithological Research Fund			
159	Balance at 1 November 1972		164	
5	Add: Interest for year		9	
164			173	
–	Less: Grant to atlas scheme		50	
164				123
	Other Reserves			
200	Library cataloguing fund		200	
850	*London Naturalist* reserve		950	
750	*London Bird Report*		750	
	Plant mapping scheme: research and publication fund:			
	Balance at 1 November 1972	225		
	Add: Grant from general account	50		
225			275	
2,025				2,175
	Accumulated Fund			
(125)	Balance at 1 November 1972 (deficit)		(292)	
(167)	Transfer from general account (deficit)		(188)	
(292)				(480)
53,378				£56,610

at 31 October 1973

1972	Assets	
10,000	Quoted investments at cost	21,931
12,832	Bank deposit account	17,028
447	Bank current account	383
22,093	United Dominion Trust	8,622
8,006	Central Investment Company	8,646
53,378		£56,610

Report of the Auditors to the members of
the London Natural History Society

We have verified the accounts with the books and records of the Society and certify them to be in accordance therewith.

Knightway House,
20 Soho Square,
LONDON, W1V 6QJ

NORTON KEEN & CO.
Chartered Accountants

5 December 1973

General

1972	Payments	
363	Hire of halls etc.	450
224	Sectional expenses including L.N.C.C.	209
59	Subs. to other societies	54
61	Printing and stationery	117
78	Library	47
12	Castell research centre	6
350	Honoraria	265
119	Postage and telephone	110
37	Sundries	14
162	Castell bequest expenses	173
398	Purchase of addressograph machine	98
43	Cost of services (auditors' fees, bank charges, insurance)	48
–	Hindson memorial lecture	46
1,839	Grant to publications account	2,093
3,745		3,730
	Transfers to Reserves:	
25	Plant mapping scheme research and Publication fund	50
3,770		£3,780

Publications

1972		
277	*Programme*	307
–	*London Naturalist* **51** (Excess of expenditure over reserve)	144
850	*London Naturalist* **52** reserve	950
122	*London Bird Report* **35** (Excess expenditure over reserve) (£772—£650)	–
750	*London Bird Report* **37** reserve	750
197	*Bulletin*	326
2,196		£2,477

Account

1972	**Receipts**		
2,618	Subscriptions— current	2,673	
22	arrears	6	
45	advance	73	
43	entrance fees	–	
2,728			2,752
46	Donations		57
168	Tax recovered from deeds of covenant		–
24	Deposit account interest (Nat. Westminster Bank Ltd.)		211
55	Deposit account (Central Inv. Co.) ex. premises fund		91
14	Sundries including bird film receipts		78
40	Transfer from life composition account		–
100	honoraria reserve		–
398	premises and equipment fund		234
30	Castell bequest		169
167	Excess of payments over receipts (transferred to accumulated fund)		188
3,770			£3,780

Account

235	Sale of publications	294
15	Bulletin income	16
7	Sale of reprints etc.	–
1,839	Transfer from general account	2,093
100	*London Naturalist* **50** (excess reserve over expenditure) (£850—£749.98)	–
–	*London Bird Report* **36** (excess reserve over expenditure) (750—£676)	74
2,196		£2,477

Instructions to Contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr J. R. Laundon, Department of Botany, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include an abstract, summary or synopsis.

Text

Spellings are to follow *Chambers Twentieth Century Dictionary* 1972 edition; locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalisation should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. Genus names should appear in full where first used within each paragraph. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parenthesis where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22** : 130-132 (1895)) except that a colon should always precede a page number. Capitalisation in titles of papers in journals, should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:

In text:
Meadows (1970 : 80). (Meadows 1970).

In references:
MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49** : 76-81.
MELLANBY, K. 1970. *Pesticides and Pollution.* Ed. 2. Collins, London.
WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92** : 39-45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4·0 mm and tetrad crosses 5·0 mm, with a line thickness of 0·8 mm; all monad symbols should be 1·6 mm with a line thickness of 0·5 mm. The legend should be written outside the frame of the map and will be set up by the printer. The Mapping Schemes Secretary can provide Recording Maps, advice and dyes for printing distribution symbols.

Line drawings should be in Indian ink on Bristol board, preferably twice the printed size. Place names, etc., must be produced with stencils or Letraset. Legends should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Galley proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to twenty-five free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

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Published September 1974